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Wetland mitigation in Indiana: Policy practice and outcomes

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Wetland Mitigation in Indiana: Policy, Practice, and Outcomes

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Wetland Mitigation in Indiana: Policy, Practice, and Outcomes.

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At the time of Colonial America, the area that now constitutes the lower 48 states contained an estimated 221 million acres of wetlands. By the 1980s, an estimated 104 million acres of wetlands remained (Dahl 1990). Estimates for the state of Indiana suggest even greater losses (87% loss). To combat these trends the US Government began to regulate dredge and fill disposal within U.S. "navigable waters", including wetlands, through section 404 of the Clean Water Act. This authority to regulate fill of wetlands was challenged, resulting in the development of a complicated process called compensatory wetland mitigation. Through this process anyone wanting to fill a wetland can do so upon passing several hurdles and agreeing to restore, expand or create an appropriate number of acres of wetland to compensate for the original loss. Concerns over the outcomes of this process are of particular importance in states like Indiana where few wetlands remain. This thesis examines the policy and process of compensatory mitigation in Indiana and includes functional assessments of 4 Indiana mitigation sites in order to evaluate some of the outcomes of the process.

Compensatory mitigation in Indiana involves several steps and is regulated by two agencies: the Indiana Department of Environmental Management (IDEM) at the state level and the United States Army Corps of Engineers (USACE) at the federal level. IDEM regulates wetland fill through section 401 of the Clean Water Act (CWA). Under this process, fill material is considered a water pollutant, and wetland fills over a 1/10 of an acre require an IDEM permit. Successful applicants for these permits must show that 1) they have explored all practicable alternatives and that none exist; 2) the impact will not result in significant degradation to the aquatic ecosystem; 3) appropriate and practicable steps will be taken to minimize impacts to wetlands; and 4) satisfactory compensatory mitigation will be undertaken. The USACE also requires a permit for dredge and fill activity to wetlands under section 404 of the CWA. Upon completion of a wetland delineation, the applicant either applies for a nationwide permit or a full 404 activity permit. Most nationwide permits are streamlined and generally easier to obtain. 404 permits require similar demonstrations to IDEM's permit and take longer to obtain. Most applications for both 401 and 404 wetland activities are approved.

In addition to this policy and process review, this report includes four case studies evaluating some wetland mitigation outcomes. The Wisconsin Department of Natural Resources Rapid Assessment Methodology for evaluating Wetland Functional Values (WIRAM) was used to evaluate these sites. Two of the evaluated mitigation sites received high scores for their wetland function, while two received low scores. Through these case studies and policy analyses, some general conclusions can be made: 1) Establishing wetland hydrology is the most critical factor in the success or failure of a mitigation wetland. This can be improved by conducting detailed water budgets for projects, which can be used for proper design of the wetlands, 2) The most successful mitigation projects are located in floodplains or near other wetlands; and 3) Enforcement of mitigation requirements is lax. Sites are released regardless of function and health upon completion of five years of monitoring. More critical field investigations need to be completed (by both IDEM and USACE) and remediation steps should be required for sites that are not developing wetland functions to an adequate degree.

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Introduction

At the time of Colonial America, the area that now constitutes the 50 United States contained an estimated 392 million acres of wetlands. Of this total, 221 million acres were located in the lower 48 states. As of the 1980s an estimated 104 million acres remained in the lower 48 states. This amounts to a 53-percent loss from the original acreage (Dahl 1990). Fueling the destruction of wetlands was the view that these ecosystems were unproductive and unhealthy portions of the landscape, that should be converted to more beneficial uses (agriculture, development, etc). Prior to the mid-1970s, wetland filling and destruction were accepted practices in the United States and were actively encouraged by certain government policies (Mitsch and Gosselink 1986). The growth of the environmental movement and improved scientific knowledge of the values and functions of wetlands helped to slow the filling trend, however we have yet to see either a no net loss or a net gain of wetlands in the US. Indeed between the 1970s and 1980s, the United States lost 2.6 million acres of wetlands, an amount twice the size of the state of Delaware (Hansen and others 1995). On average, the lower 48 states have lost more than 60 acres of wetlands for each hour that has passed between the 1780s and the 1980s (Dahl 1990). California has lost 91% of its historic wetlands; Ohio has lost 90%; Iowa 89% and Indiana 87% (Hansen and others 1995). Even though we now have federal and state laws that protect against the filling of wetlands, it is estimated that the US is still losing approximately 290,000 acres of wetlands per year (Strand 1997).

The state of Indiana represents a classic example of our nation's past and present practice of filling wetlands to serve anthropomorphic purposes. Thanks to glaciation a majority of the state was readily available for agricultural conversion. Simply clearing

vegetation and filling low areas provided the early Hoosiers with excellent agricultural farmland. This agricultural filling was supported by the opinion that swamplands, bogs, sloughs and other wetland areas were wastelands to be drained, filled or manipulated to "produce" other than natural commodities (Mitsch and Gosselink 1986). These two factors led to the rapid demise of Indiana's historic wetlands. Estimates of original wetlands (circa 1780s) amounted to 5,600,000 acres. By the 1980s Indiana was left with an estimated 750,633 acres (an 87% decline) (Dahl 1990). The loss has been so significant that the Indiana Department of Natural Resources named a recent publication *Wetlands-Indiana's Endangered Natural Resource*.

Considering these realities, Indiana should treat the few remaining wetlands it has as endangered ecosystems. Stringent protection measures should be taken to retard the filling process, and conservation programs to restore and enhance wetlands should be of paramount importance. However, other powerful forces would like to fill Indiana's remaining wetlands. These "new" forces want to fill wetlands for different reasons than their forefathers. Now filling occurs for suburban sprawl, golf course development, commerical buildings, etc. Wetland filling now requires permits, but Indiana wetland resources continue to dwindle.

State and Federal regulations have been passed to slow the filling of wetlands. The primary statutes which protect wetlands are section 401 and 404 of the Clean Water Act (formerly the Federal Water Pollution Control Act). The Indiana Department of Environmental Management (IDEM) has authority over section 401 activities and the United States Army Corp of Engineers (USACE) regulates 404 activities. Both of these statutes generally protect wetlands by regulating the discharge of fill or "pollutants" into

wetlands. However, wetlands can still be filled by applying for a permit and following a complicated process known as compensatory mitigation. Essentially this process enables landowners to fill wetlands provided they follow certain standards and criteria, which require the creation, restoration or enhancement of an appropriate number of wetland acres as compensation for the original loss. Is wetland mitigation successfully protecting Indiana's wetland resources? To answer this question, we must evaluate the status and trends of Indiana wetlands.

Although mitigation is intended to result in "no net loss" of wetlands, there are still many questions about the ecological impacts of wetland mitigation. Some of these include: Do created or restored wetlands really replace the ecological functions that natural wetlands served? Can humans create and restore comparable, self-sustaining wetlands? Are the "new" wetlands providing a suitable replacement habitat for wildlife? What are the overall landscape implications of this practice? Are restored/constructed wetlands being properly developed and monitored? Due to the complexity of wetlands, and the relatively brief history of wetland mitigation, many of these questions cannot be answered conclusively. Debate continues among wetland ecologists as to the impact and outcomes of wetland mitigation.

Regardless of these fundamental questions concerning the practice, it appears that wetland mitigation is here to stay. With this realization, the focus then is to analyze and evaluate the process so that weaknesses can be identified. Where weaknesses are found, improvements should be made so that mitigation does in fact replace natural wetlands with restored or constructed, self-sustaining wetlands that possess proper structure and function and provide similar values.

Several other factors call for more research into the wetland mitigation process in Indiana. A few of the most prominent include: 1) Evidence suggests that the legal requirements for mitigation are not always followed and that healthy functioning wetlands are not always restored/created (Zedler and Callaway 1999, Metz 1998, Fennessy 1997, Mitsch and Wilson 1996 and Kentula and others 1992) and 2) In Indiana, the timing is right for such an investigation, with the principal state agency involved in wetland mitigation (Indiana Department of Environmental Management) currently developing draft wetland water quality standards and section 401(CWA) water quality certification implementation procedures. Given this, efforts to assess and evaluate the outcomes of wetland mitigation are timely and of critical importance.

In order to keep the focus simple, this thesis will address two main objectives: 1) Produce a citizen's guide to the Indiana wetland mitigation process, with recommendations for improvements in relevant policy and science and 2) Illustrate the guide with case studies of wetland mitigation projects in Indiana by summarizing their history and assessing their health.

Citizen's Guide to Wetland Regulation in Indiana

The federal government's approach to wetlands law is highly complicated, at least in part because there is no single federal wetlands law. Rather, a number of federal statutes and programs address protection and use of wetlands (Strand 1997). In Indiana two different agencies are responsible for regulating wetland activities through two different federal statutes. Needless to say, understanding how wetlands are regulated (and how citizens can become involved in the process) requires a great deal of research. This thesis will provide Indiana citizens with a reference tool, or guide, to the wetland mitigation process. This will be accomplished by 1) describing the evolution/development of federal

wetlands regulation, 2) identification of the federal statutes and agencies that regulate wetland activities in Indiana and 3) analyzing the steps in the Indiana wetland mitigation process. In addition, through the completion of functional assessments on four mitigation sites (objective #2), case histories will illustrate the unique series of steps and factors which led to compensatory mitigation, the relevant state/federal permits required, and the agencies involved in the process. This report will provide a description of the specific wetlands filled and created (in-kind versus out-of-kind, on-site versus off-site, and whether it was a restored or a created wetland). Such information will provide the public with a helpful, condensed handbook on the details of wetland mitigation in Indiana.

Functional Assessments of Wetland Mitigation projects in Indiana

With regard to the second objective, a specific wetland functional assessment methodology will be used to evaluate four mitigation wetland sites in the Central Indiana area. Results from these assessments will present new information on the status of these wetlands, thus providing wetland mitigation regulatory agencies with feedback on the outcomes from these mitigation wetlands and reference information for future monitoring and wetland evaluations.

By analyzing and evaluating the four wetland mitigation sites, common problems (in the four sites) will be identified. Where weaknesses are found, recommendations will be made. The ultimate goal will be to provide suggestions and information which can be used to improve the process and its outcomes. The 1990 Memoranda of Agreement between the EPA and the Army Corps of Engineers stipulates that functions and values of wetlands should be assessed by applying wetland functional assessment techniques generally recognized by experts in the field and/or the best professional judgment of

federal and state agency representatives (Ainslie 1994), thus the need for such assessments is warranted.

Historical Evolution of Wetlands Regulation and Wetland Mitigation

Brief History of Wetlands Regulation

In order to understand the wetland mitigation process, it is important to understand the legislative history and policy development of wetlands regulation in the United States. For the majority of American history, wetlands were thought of as wastelands, or portions of the landscape ripe for conversion to agricultural or developmental purposes. It wasn't until the late 1960s that the United States Army Corps of Engineers began to issue regulations to protect wetlands. It did so through the Rivers and Harbors Act (RHA) of 1899 (principally through Section 10 of the Act, which authorizes the Corps of Engineers to regulate dredge and fill activities in navigable waters of the United States). While the original focus of the RHA was on navigation, the government began using the Act in the 1960s as a tool to control water pollution. Specifically, the Corps began enforcing the RHA's prohibition against the permitless discharge of "refuse", which was broadly interpreted to include the control of industrial water pollution (Strand 1997).

In addition, amendments to the Fish and Wildlife Coordination Act directed federal agencies involved in the alteration of a waterbody to consult with the Fish and Wildlife Service with a view to the conservation of wildlife resources. In 1967, the Secretaries of the Army and the Interior implemented these amendments by entering into a Memorandum of Agreement in which the Army Secretary agreed to consider the views of Interior on the merits of proposed activities. This led to the Corps changing its permit regulations to undertake a "public interest" review in which it considered not only navigational effects, but many others including ecological effects (Want 1989).

In 1967 the Corps then denied a permit for the fill of 11 acres of submerged land in Florida on the new ecological effects criteria (Want 1989). The developers challenged this ruling on the basis that the RHA did not provide the Corps with the power to deny permits on ecological grounds. However, in 1970, the US Court of Appeals for the Fifth Circuit upheld the Corps' ability to deny wetland permits on ecological grounds in *Zabel vs. Tabb* (Want 1989). This set a precedent for the Corps to weigh public interest factors in reviewing and denying RHA permit applications, including environmental consequences (Strand 1997).

During this time there was a growing movement in America towards water pollution control and wetlands protection. This movement helped pass the 1972 amendments of the Federal Water Pollution Control Act (FWPCA). Due to the amendments' focus on the problem of water pollution, the FWPCA became know as the Clean Water Act (CWA). These amendments' goals were to restore and maintain the chemical, physical and biological integrity of the waters of the United States and eliminate all pollution discharges by 1985. The CWA does not mention the word "wetlands", but section 301 prohibits "the discharge of any pollutant by any person" without a permit (33 U.S.C. 1311(a)). This includes "any addition of any pollutant to navigable waters from any point source" (33 U.S.C. 1362(12)). Of particular significance here is the term "navigable waters" which is defined in the statute as "the waters of the United States, including the territorial seas" (33 U.S.C. 1362(7)). The EPA and the Corps were given responsibility for defining "waters of the United States". These agencies later interpreted this term in (40 C.F.R. 230.3(s)(1-7) to mean:

1) All waters which are currently used, or were in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2) All interstate waters including interstate wetlands;
3) All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
   (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
   (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
   (iii) Which are used or could be used for industrial purposes by industries in interstate commerce;
4) All impoundments of waters otherwise defined as waters of the United States under this definition;
5) Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
6) The territorial sea;
7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section...

These amendments of the Clean Water Act also created the principal federal wetlands regulatory statute: section 404. Whereas most of the CWA is administered by the EPA, section 404(a) granted the Corps the responsibility to issue permits for the discharge of two types of pollutants: dredged and fill material (33 U.S.C. 1344). This was due to a couple of reasons: First, the Corps' prior experience administering the RHA section 10 program. Second, the Corps' legislative backers did not want another agency to be involved with the regulation of dredge and fill activities (Want 1989). However, a legislative debate ensued over which agency, the Corps or EPA, should be in charge of the new 404 program. Senator Edmund Muskie (D-Me.), a principle backer of the 1972 amendments, was concerned that the Corps might not be as protective of the environment as the EPA. In the end, the House chose to give the Corps the authority for issuing permits, subject to oversight by the EPA (Strand 1997).

The CWA has become the primary statute that regulates activities in wetlands; however, there are additional federal laws, executive orders and programs that address wetlands, thus complicating the issue of wetlands protection and regulation even more. Among these is the "Swampbuster" program within the Food Security Act of 1985. This program was designed by Congress to discourage the conversion of wetlands to croplands, by withholding federal farm program benefits from anyone who converts a wetland (through draining, filling, leveling or any other means) to an agricultural use (Kusler and Opheim 1996). However, Swampbuster only applies to activities that have occurred since December 23, 1985. All activities prior to this date are exempt from the program (Strand 1997). This program is administered by the Natural Resources Conservation Service (NRCS).

The Coastal Barrier Resources Act of 1982 prohibits new federal expenditures and financial assistance for projects within the Coastal Barrier Resource System, which includes wetlands. The Fish and Wildlife Coordination Act authorizes the Fish and Wildlife Service (FWS) to protect resources important to the conservation and production of fish and wildlife (16 U.S.C. 661-666). This Act requires that the FWS be consulted on federal water projects that may affect wildlife. The Emergency Wetlands Resources Act of 1986 fosters cooperation between federal, state, and local groups for the purposes of wetland management and conservation and supports the development of reports on regional and national wetland status. The Coastal Zone Management Act authorizes federal-state programs to protect the coastal zone, including wetlands (Strand 1997). The Water Resources Development Act of 1990 required the Corps, EPA and the FWS to develop a wetlands action plan to achieve a "no net loss" of the nation's remaining

wetlands. The National Flood Insurance Act of 1968 supports government guaranteed flood insurance to localities where landuse plans limit development in floodplains. Executive Order (EO) 11990 (Protection of Wetlands), issued in 1977 by President Carter, stipulated that federal agencies minimize the "destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands". EO 11988, also issued by President Carter in 1977, instructs federal agencies to avoid undertaking projects that would have a deleterious impact on floodplains or floodplain management. Also, Congress (1990), President Bush (1988) and President Clinton (1993) have endorsed a goal of "no net loss" of the nation's wetlands (Kusler and Opheim 1996). Finally, section 401 of the CWA (33 U.S.C. 1341) often applies to wetlands. This section requires "any applicant for a federal license or permit to conduct any activity that may result in a discharge into waters of the United States to first obtain a water quality certification (or waiver) from the state in which the discharge originates". IDEM implements section 401 of the CWA for the state of Indiana.

Development and Definition of Wetlands Mitigation

Having established primary responsibility of section 404 , the Corps soon faced a new problem: how to regulate the discharge of pollutants into "navigable waters of the United States"? Their initial approach was to do nothing in regards to wetland areas. They continued to define navigable waters as waters subject to the ebb and flow of the tides and waters that have traditionally been used for interstate or foreign commerce. This narrow view did not include wetlands as "navigable waters". In response, environmental groups protested that the definition of navigable waters should apply to the entire aquatic system, including small streams, tributaries and wetlands (Strand 1997). In 1975 this

issue was resolved in *Natural Resources Defense Council v. Callaway* (Kusler and Opheim 1996). In this case the US District Court for the District of Columbia invalidated the Corps' regulations, finding that they applied section 404 of the CWA too narrowly. As a result of this case, the Corps were forced to expand their regulatory authority to include adjacent wetlands and isolated waters (Kusler and Opheim 1996). From this point on, the definition of "navigable waters" encompassed a much broader range of aquatic systems for regulatory purposes.

Despite the clarification of 404 jurisdiction, discharges of dredged and fill material were far from over. Although *Natural Resources Defense Council v. Callaway* forced the Corps to regulate wetland fills, it did not address the protocol for impacts. Wetland areas were now regulated, but little consideration was given to how a variety of wetland uses would cumulatively result in wetland degradation (Kusler and Opheim 1996). Section 404(b)1 required that the decision to issue permits for the discharge of dredged and fill material be based on guidelines developed by EPA in conjunction with the Corps. These guidelines, found in 40 CFR 230, were first developed in interim form in 1975 and then revised and issued in final form in 1980. The Corps did not immediately incorporate these guidelines into their evaluation of permits because they did not know whether they were mandatory. Eventually the Corps realized they were required and began to apply the EPA Section 404(b)1 guidelines. However the Corps did not adopt the EPA's views on their application (Want 1989). These differing opinions of the application of 404(b)1 guidelines led to conflicts between the two agencies in which the EPA exercised its 404(c) powers (which grants the agency a veto authority over the issuance of Corps'

permits (Want 1989)). One issue which led to a veto by the EPA is the mitigation of impacts on wetlands.

The Corps' stance on mitigation inferred that it could be used to satisfy the public interest test and other legal requirements for the issuance of a permit (Want 1989). However, the EPA considered mitigation to be a last step after having made attempts to avoid filling wetlands, trying to minimize impacts and repairing or rehabilitate that which would still be damaged. Section 404(b)1 guidelines state that an applicant must consider all practicable alternatives before a permit to fill a wetland is issued. The Corps and EPA's conflicting mitigation views met in one of the biggest wetland controversies: the *Sweedens Swamp* case in Attleboro, Massachusetts (Want 1989).

In this case, the Pyramid Company proposed to develop a shopping mall on an 80 acre tract that contained 25 acres of wetlands. To offset the impacts, Pyramid proposed to create 9 replacement acres of wetland on-site and enhance 13 additional acres of wetlands on the site as well. In addition, the developer proposed an off-site mitigation plan which would have created 36 additional acres of replacement wetlands. The Corps approved the plan and notified the EPA of its intent to issue the permit on June 28, 1985 (Want 1989). Upon this notice, EPA's Region 1 initiated section 404(c) proceedings. The EPA vetoed the permit on the basis of its different views on the Section 404(b)1 guidelines and mitigation policy. Specifically, the EPA determined that there were practicable alternatives for the project and that Pyramid's off-site mitigation proposal should not be interpreted as establishing the plan as environmentally preferable to any other alternative site. In addition, the EPA also expressed skepticism about mitigation, particularly wetlands creation (Strand 1997). In *Bersani vs. United States Environmental Protection*

Agency the court upheld the EPA's veto of the project and agreed with the EPA that there was uncertainty with regard to the developer's mitigation proposal. In particular, the court expressed concern that 1) the net increase in habitat values at the off-site location would not compensate for the values lost; 2) that the new wetlands would be smaller and different in type than those lost; and 3) the new wetlands would provide habitat for a different species (Want 1989). This case established that applicants must exhaust all practicable alternatives in considering a wetland impact project and illustrated the gap between the Corps' and EPA's interpretation of 404(b)1 guidelines.

This necessitated a MOA between the Corps and the EPA on February 7, 1990, which stated that any section 404 activity must use mitigation sequencing to achieve the "no net loss" federal policy towards wetlands (see Appendix D). This agreement had the effect of approving and outlining acceptable steps for wetland mitigation, which is defined as the practice of allowing unavoidable losses of wetlands in exchange for their replacement elsewhere through restoration or through construction of new wetlands (National Research Council 1995). The MOA (known as the "*Mitigation MOA*") laid out the following steps for "mitigation sequencing":

1) *Avoidance*. Section 230.10(a)(contained within 40 CFR) allows permit issuance for only the least environmentally damaging practicable alternative. The thrust of this section on alternatives is avoidance of impacts. Section 230.10(a) requires that no discharge shall be permitted if there is a practicable alternative to the proposed discharge which would have a less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. In addition, Section 230.10(a)(3) sets forth rebuttable presumptions

that 1) alternatives for non-water dependent activities that do not involve special aquatic sites are available, and 2) alternatives that do not involve special aquatic sites have less adverse impact on the aquatic environment. Compensatory mitigation may not be used as a method to reduce environmental impacts in the evaluation of the least environmentally damaging practicable alternatives for the purposes of requirements under Section 230.10(a).

2) *Minimization.* Section 230.10(d) states that appropriate and practicable steps to minimize the adverse impacts will be required through project modifications and permit conditions. Subpart H of the Guidelines describes several (but not all) means for minimizing impacts of an activity.

3) *Compensatory Mitigation.* Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been required. Compensatory actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands) should be undertaken, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). If on-site compensatory mitigation is not practicable, off-site compensatory mitigation should be undertaken in the same geographic area if practicable (i.e., in close physical proximity and, to the extent possible, the same watershed). In determining compensatory mitigation, the functional values lost by the resource to be impacted must be considered. Generally, in-kind compensatory mitigation is preferable to out-of-kind. There is continued scientific uncertainty regarding the success of wetland creation or other habitat development. Therefore, in determining the nature and extent of habitat development

of this type, careful consideration should be given to its likelihood of success. Because the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, restoration should be the first option considered.

This sequence of steps became the Corps protocol for considering 404 permit applications. Projects now had to pass these "tests" before a permit could be issued. This MOA also introduced some new language in regards to "preferred" mitigation. Some of these terms should be clarified: "On-site mitigation" refers to mitigation that occurs within the same watershed or drainage area as the wetland being impacted. The EPA and the Corps determined this form of mitigation to be optimal because wetland functions and habitat values are more likely to be replaced if another wetland is created or restored within the same geographic region. Benefits of on-site mitigation include seed bank drift, migration of various wildlife to the new habitat and the possible relocation of aquatic life to the new wetland.

"Off-site mitigation" refers to the process of creating or restoring a wetland outside of the watershed in which the fill occurs. "In-kind mitigation" involves projects that attempt to replicate the same type of wetland being filled (e.g. emergent/open water, scrub/shrub, forested, etc.). This is thought to have many of the same benefits as on-site mitigation (e.g. habitat and functional replacement). "Out-of-kind mitigation" means creating or restoring a different wetland type than the wetland being filled. Restoration refers to mitigation that attempts to restore a wetland which may be inundated with exotic species, lacking appropriate hydrology, being used for farming, etc. Finally, "enhancement projects" involve attempts to "improve" an established wetland to offset the impacts of a wetland fill (e.g. developing a deep water aquatic wetland community where none

previously existed, within an established wetland). Benefits of restoration/enhancement projects include improved seed drift, migration by wildlife and increased hydrologic success (due to proximity to reliable water sources). Considering these factors, the Corps and EPA prefer restoration and enhancement projects to creation projects.

Also of note in this "Mitigation MOA" is section B and D within *III. Other Procedures*. Section B states that "the objective of mitigation for unavoidable impacts is to offset environmental losses. Additionally for wetlands, such mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values)". Section D states that "monitoring is an important aspect of mitigation, especially in areas of scientific uncertainty. Monitoring should be directed toward determining whether permit conditions are actually complied with and whether the purpose intended to be served by the condition is actually achieved".

This MOA provided the Corps and the EPA with a reasonable set of standards and steps in regards to 404 "mitigation sequencing". However, applicants still may face additional regulatory conditions, such as state 401 certification and various county guidelines. The next part of this report will address wetlands mitigation as it is applied in the state of Indiana.

Wetland Mitigation Programs in Indiana

In Indiana, federal and state regulations apply to proposed projects involving wetland impacts. The principal statutes include section 404 and 401 of the CWA. The Army Corps of Engineers administers section 404 activities within the state. Two Corps districts (Louisville and Detroit) have geographic authority over different parts of the state (see Appendix E). The Indiana Department of Environmental Management (IDEM) implements section 401 of the CWA for the state of Indiana. This program applies to: "any applicant for a Federal license or permit to conduct any activity that may result in a discharge into waters of the United States must first obtain a water quality certification (WQC) from the state. In general, anyone who is required to obtain a permit from the Corps to engage in dredging, excavation or filling activities must obtain WQC" (IDEM 2000).

Steps in the Indiana Wetland Mitigation Process

U.S. Army Corps of Engineers 404 Permit Process

The Corps' 404 program requires an Indiana applicant to go through several steps before a permit is issued or denied. These steps are outlined below:

1) *Wetland Determination.* If there is any question as to whether there may or may not be a wetland impacted by a project, a wetland determination, or delineation should be conducted by a wetland scientist (The Society of Wetland Scientists certifies wetland scientists. Some Corps Districts provide lists of available consultants, but do not certify or endorse them). A wetland delineation will determine if there are any "jurisdictional" wetlands within the proposed project's boundaries. "Jurisdictional wetlands" are defined as wet areas that fall within the regulatory jurisdiction of the

Corps of Engineers (Hansen and others 1995). Such wet areas must meet three criteria identified by the *Corps of Engineers 1987 Wetlands Delineation Manual.* These include: 1) *Hydrology* – Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support hyrdophytic vegetation; 2) *Hydrophytic Vegetation* – Plant life growing in water or on a substrate that is at least potentially deficient in oxygen as a result of excessive water content (Hansen and others 1995); and 3) *Hydric Soils* – A soil that is flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (Tiner 1998). Anaerobic conditions are defined as a situation in which molecular oxygen is absent (or effectively so) from the environment (Wetland Training Institute 1995). Wetland determinations can become very technical, and sometimes controversial, due to various interpretations of the above parameters. The Corps are responsible for evaluating wetland delineation reports and either accepting or challenging their conclusions.

2) *Preapplication Consultation.* If a wetland delineation determines that there are jurisdictional wetlands within the boundaries of a proposed project, and the project will impact such wetlands, then preapplication consultation/coordination with the Corps district engineer is recommended. Such meetings enable the Corps to advise applicants on studies and other information that may be required to process 404 permit applications. In addition, the Corps may provide useful information in regards to permit requirements and factors the agency evaluates (Strand 1997).

At this time, the Corps will determine if an individual, nationwide or general permit is required. Individual permits typically involve projects that will impact more

than 1 acre of wetlands. Such permits must meet the environmental standards within section 404(b); therefore, individual permit applications take several months to process. General (not site specific) permits were first developed in 1982 to provide flexibility in administering the 404 permit program. These permits authorize the Corps to promulgate permits for certain activities on a state, regional or nationwide basis. General permits developed by Corps headquarters for nationwide application are called "nationwide permits". Locally issued general permits are called "general ,or regional, permits" (Strand 1997). There are numerous nationwide permits that may be applied in Indiana and additional general (regional) permits coordinated between the Corps and IDEM. Nationwide and general permits were developed for projects that are determined to impose such "minimal impacts" that the full review given to individual permits is not necessary.

It is worth noting here that the Corps recently announced the issuance of 5 new Nationwide Permits (NWPs) and the modification of 6 existing NWPs to replace NWP 26. Under most of these new NWPs the maximum acreage limit is now ½ acre. Under the old NWP 26 impacts were permitted up to an acre, without mitigation, thus a significant new threshold has been established. In addition, the new NWPs set specific conditions and criteria for certain activities.

Such permits require notification of the Corps if the affected wetlands area is one tenth of an acre (0.10) or greater. Early coordination with the Corps will help applicants determine which of the various nationwide and general permits may apply to his or her project and what is required under such permits.

3) *Submit Appropriate Applications*. All applicants for a 404 permit must use standard

application form ENG Form 4345 (See Appendix B). This form requires the applicant to provide such information as location of project, directions to the site, the nature of the activity, the project's purpose, reason for discharge of fill material, type and amount of fill material and the surface area, in acres, of wetlands to be filled. In addition, the application must contain appropriate information to demonstrate compliance with the requirements of the 404(b)1 guidelines (Strand 1997). The application fee for 404 permits is $100.00. In most cases nationwide and general permits do not require an application. Discussions and early coordination with the Corps often is all that is necessary.

4) *Public Notice.* Within 15 days of receipt of an application, the Corps must assign an identification number, acknowledge receipt of the application and review the application for completeness. If the application is determined to be complete, then a public notice is issued (sent to local landowners, lists of concerned citizen groups, and local post offices). Public notices provide information on proposed projects and provide an opportunity for interested parties to submit comments on the project. In addition, the notice notes that any person can request a public hearing and provides details on how to do so. Comments received from public notices are reviewed by the district engineer and become a part of the administrative record for the application (Strand 1997). *Anyone concerned with a project can submit their comments at this time.

5) *Comment Periods and Public Hearings.* The Corps generally adhere to a comment period between 15 and 30 days. The district engineer then reviews the comments and determines if there is a need for a public hearing (at his or her discretion). If a public

hearing is warranted, a 30 day notice of the hearing is required. Public hearings are informal and provide an opportunity for any person to present oral or written statements concerning a proposed project. If there is no need for a public hearing, the Corps are instructed to decide on an application no later than 60 days upon receipt of an application.

6) *Evaluation Factors/Decision Criteria.* In evaluating permit applications, the Corps consider a number of factors. These include conservation, economics, aesthetics, environmental, fish and wildlife values, flood protection, general public welfare, historic values, recreation, land use, water supply, water quality and navigation (Kusler and Opheim 1996). In evaluating these factors, the Corps is required to "give full consideration" to the views of the Fish and Wildlife Service, the National Marine Fisheries Service and the state agencies responsible for fish and wildlife. In addition, the EPA has the authority under 404(c) to review individual permits. Upon completion of the evaluation process, and having received other agencies' input, the Corps must then weigh the benefits of the project against the detriments. This is known as the "public interest review" (Want 1989).

Prominent in this evaluation process is a project's compliance with section 404(b)1 guidelines and related laws such as the National Environmental Policy Act, the Endangered Species Act and the National Historic Preservation Act. Under section 404(b)(1), wetlands are considered to be "special aquatic sites" and subject to greater protection than other waters because of their significant contribution to "the general overall environmental health or vitality of the entire ecosystem of the region" (40 C.F.R. 230.3(q-1)). The guidelines identify the valuable functions and

characteristics of wetlands that warrant this special protection (40 C.F.R. 230.41(b)). The specific elements of the guidelines are listed below:

- *Practicable Alternatives.* The 404(b)1 guidelines provide a "practicable alternatives" test, which requires applicants to consider other available alternatives to filling (Strand 1997). The guidelines specifically state:

> [N]o discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 C.F.R. 230.10(a)).

This guideline presumes that projects that do not have to be located in a wetland will have other upland alternatives. In addition, there is also a presumption that other alternatives that involve discharges into non-wetland areas will have a less adverse impact on the aquatic environment.

- *No Significant Degradation.* This guideline also prohibits discharges of dredged and fill material that will "cause or contribute to significant degradation of the waters of the United States" (40 C.F.R. 230.10(c)). Significant degradation is determined by the effects on each of the following items:

  - *Physical substrate determinations.* Determine the nature and degree of effect that the proposed discharge will have, individually and cumulatively, on the characteristics of the substrate at the disposal site (40 C.F.R. 230.11(a);
  - *Water circulation, fluctuation, and salinity determinations.* Determine the nature and degree of effect that the proposed activity will have individually and cumulatively on water, current patterns, circulation including downstream flows, and normal water fluctuation (b);
  - *Suspended particulate/turbidity determinations.* Determine the nature and degree of effect that the proposed discharge will have, individually and cumulatively, in terms of potential changes in the kinds and concentrations of suspended particulate/turbidity in the vicinity of the disposal site (c);
  - *Contaminant determinations.* Determine the degree to which the material proposed for discharge will introduce, relocate or increase contaminants (d);
  - *Aquatic ecosystem and organism determinations.* Determine the nature and

degree of effect that the proposed discharge will have, both indivdually and cumulatively, on the structure and function of the aquatic ecosystem and organisms(e);

- *Proposed disposal site determinations.* Each disposal site shall be specified through the application of certain guidelines which include the identification of the smallest practicable mixing zone. This zone is determined by (i) depth of water at the disposal site; (ii) current velocity, direction and variability at the disposal site; (iii) degree of turbulence; (iv) stratification attrituable to causes such as obstructions, salinity or density profiles at the disposal site; (v) discharge vessel speed and velocity; (vi) rate of discharge, etc.(f).
- *Determination of cumulative effects on the aquatic ecosystem.* Cumulative impacts are the changes in an aquatic ecosystem that are attrituable to the collective effect of a number of individual discharges of dredged or fill material(g).
- *Determination of secondary effects on the aquatic ecosystem.* Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but not a result form the actual placement of the dredged or fill material (h).

o *Mitigation or Minimizing Impacts.* The 404(b)1 guidelines also establish that steps must be taken to achieve minimal adverse impacts. This section states:

> [N]o discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.(40 C.F.R. 230.10(d)).

Subpart H of 40 C.F.R. 230 lists various steps to minimize adverse impacts. These include:

- *Actions concerning the location of the discharge* (230.70 (a-f)); (These are factors used to determine the location of the disposal site such as: (a) locating and confining the discharge to minimize smothering of organisms and (c) selecting a disposal site that has been previously used for dredged material discharge.)
- *Actions concerning the material to be discharged* (230.71 (a-d)); (Minimizing the effects of a discharge by treatment of, or limitations on the material itself, such as: (b) limiting the solid, liquid and gaseous components of material to be discharged at a particular site and (c) adding treatment substances to the discharge material.)
- *Actions controlling the material after discharge* (230.72 (a-d)); (The effects of the dredged or fill material after discharge may be controlled by certain methods including: (a) selecting discharge methods and disposal sites where

the potential for erosion, slumping or leaching of materials into the surrounding aquatic ecosystem will be reduced and (c) maintaining and containing discharged material properly to prevent point and nonpoint sources of pollution.)

- *Actions affecting the method of dispersion* (230.73(a-g)); (The effects of a discharge can be minimized by the manner in which it is dispersed, such as: (d) making use of currents and circulation patterns to mix, disperse and dilute the discharge and (g) setting limitations on the amount of material to be discharged per unit of time or volume of receiving water.)
- *Actions related to technology* (230.74(a-e)); (Discharge technology should be adapted to the needs of each site. In determining whether the discharge operation sufficiently minimizes adverse environmental impacts, the applicant should consider these factors. For example: (e) employ appropriate machinery and methods of transport of the material for discharge.)
- *Actions affecting plant and animal populations* (230.75(a-f)); (Minimization of adverse effects on populations of plants and animals can be achieved by these actions including: (a) avoiding changes in water current and circulation patterns which would interfere with the movement of animals and (f) avoiding the destruction of remnant natural sites within areas already affected by development.)
- *Actions affecting human use* (230.76(a-f)); (Minimization of adverse effects on human use potential may be achieved by these guidelines, which include: (b) selecting disposal sites which are not valuable as natural aquatic areas and (f) locating the disposal site outside of the vicinity of a public water supply intake.)
- *Other actions* (230.77(a-d)). (These are additional guidelines which do not apply to the previous actions. For example: (b) in the case of dams, designing water releases to accommodate the needs of fish and wildlife.)

In addition to these mitigation guidelines, the *Mitigation MOA* (previously described) spells out additional standards in regards to avoidance, minimization and compensation.

- *The National Environmental Policy Act (NEPA)*. This act requires that federal agencies make informed, environmentally responsible decisions, when considering federal actions that may have a significant impact on the environment (Want 1989). Corps decisions on 404 permits often involve actions with significant environmental impacts; therefore, NEPA guidelines apply. The Corps regulations require that an environmental assessment (EA) be prepared before a

404 permit can be approved. EAs include a brief description of the need for the proposed action, the environmental impacts of the action, potential alternatives and a list of the agencies, interested groups and the public consulted (Strand 1997). Upon completion of an EA, there is either a finding of no significant impact (FONSI) or the Corps determine that there will be significant impacts or that more information is needed to determine if there will be a significant impact. If it is determined that more information is warranted, then an environmental impact statement (EIS) is conducted (the applicant is responsible for the cost of an EIS). An EIS involves a more thorough evaluation of the criteria included in an EA and requires commenting from the public, state and federal agencies. Specifically, a scoping process will first be conducted to identify the substantive issues needing further study. This process involves the participation of the public. The Corps then prepares a draft EIS, which the public can submit comments on. The public may also request a public hearing. Once this process is completed, a final EIS is issued by the Corps (Want 1989). Considering these factors, a 404 permit that requires the completion of an EIS, can take a few years to be processed. * It should be noted here that the Corps individual permit process complies with NEPA guidelines by 1) Notifying the pubic (through public notice), 2) Coordinating with the public and relevant agencies, and 3) Considering alternatives.

- *The Endangered Species Act.* Wetlands are a prime habitat for many endangered species, therefore the Endangered Species Act is often a very important aspect of processing wetland permit applications. This act requires federal agencies to

consult with the National Marine Fishery Service in the Department of Commerce (marine species) or the Fish and Wildlife Service in the Department of Interior (all other species) to "insure that any action authorized is not likely to jeopardize the continued existence of any endangered or threatened species" or to adversely affect such species' critical habitat (50 C.F.R 402.01(b)). With regard to 404 permit applications, the Corps determines if any action will affect listed species. If so, they are required to consult with the NMFS or the USFWS. One of these agencies then prepares a biological opinion, which states whether a species will be jeopardized by the proposed activity. If the NMFS or the USFWS determines that a species will be jeopardized, the Corps still makes the final determination of jeopardy. However, the Corps rarely disagrees with these biological agencies views (Want 1989). In addition, the Corps nationwide permits also have requirements that apply to the Endangered Species Act.

- *National Historic Preservation Act (NHPA)*. Section 106 of this act requires that the Corps take into account "the effects, if any, of proposed undertakings on historic properties both within and beyond the waters of the United States" (16 U.S.C. 470). In addition, if a proposed project affects properties listed on the National Register of Historic Places or a National Historic Landmark, the Corps must take into account the effect of the project on the historic properties and place conditions in permits to minimize harm to such properties or mitigate adverse effects (Strand 1997). Sites with potential archaeological impacts are also evaluated. Relevant State Historic Preservation Officers and the Advisory Council

on Historic Preservation are consulted by the Corp in making these determinations. The Advisory Council also has an opportunity to comment on Corps decisions (Want 1989).

7) *Application Approved or Denied.* Once the Corps has completed its evaluation of an individual permit application, it either issues the permit or denies it. If approved, the applicant simply signs the application (agreeing to abide by all conditions) and returns with fees, then the permit is issued. Few permits are denied. If there is a problem with an application the Corps usually works with the applicant to make modifications to their application. Regardless, the Corps can deny a permit for failing any of the decision criteria in step number 6.

8) *Follow up/Monitoring/Remediation.* Upon issuance of a permit, the Corps typically enforces a five year monitoring period. This requires the permitee to provide information on the biological status of the mitigation wetland. Usually data points are established and vegetation are documented by quadrat method. This data is then used to calculate such measures as percent cover, relative frequency, relative dominance, importance value, etc. In addition, measures of the presence or absence of hydrology are recorded and soil samples are collected. These reports are then reviewed by USACE staff, who determine if the site is progressing towards the proposed wetland type (ie. forested wetland, emergent wetland, etc.). Corps staff may also make field inspections to determine if the site has been developed as planned or is progressing as the permitee claims. The Corps usually requires the full five years of monitoring for most sites; however, sites can be released early if it is determined that the wetland has met the mitigation goals. Finally, remediation can be required for sites that were

constructed incorrectly or are clearly not progressing towards the functioning wetland community type proposed in the application.

Indiana's DEM's 401 Permit Process

"In order to grant certification, the Indiana Department of Environmental Management must be assured that the activity will comply with certain provisions of the CWA. These provisions include the state's water quality standards (327 IAC 2), which are adopted pursuant to section 303 of the CWA. The applicant has the burden of proving that the proposed activity will comply with these provisions. An applicant may not proceed with the proposed project until after receiving certification from the state and a permit from the federal agency" (IDEM 1999). Steps for 401 water quality certification (WQC) from IDEM are similar to the Corps 404 procedures; however, there are some differences in regards to mitigation compliance. The following summarizes the steps involved with WQC in Indiana:

1) *Wetland Determination.* As with 404 permits, a wetland delineation is conducted to determine if there are any "jurisdictional" wetlands within the proposed projects boundaries and what acreage would be impacted by the project.
2) *Preapplication Consultation.* IDEM also recommends that applicants discuss a proposed wetland impact project with IDEM's 401 permit coordinator early in the planning stage. Such coordination will help the applicant avoid delays, confusion and insure that Indiana's environment is protected.
3) *Submit Appropriate Applications.* All applicants for a 401 permit must submit state form # 48598 (See Appendix C). This form requires the applicant to provide such information as his or her name, address and telephone number; location of the project,

directions to the site, the nature of the activity, the project's purpose, reason for discharge of fill material, type and amount of fill material and the surface area, in acres, of wetlands to be filled. In addition, the application must describe possible alternatives to the project, ways to minimize impacts and demonstrate compliance with all requirements.

4) *Public Notice*. Within 3 working days of receipt of an application, IDEM will issue a public notice and assign an ID number to the application.. Notice is typically given to adjacent landowners, various regulatory agencies and those who have requested notice. In addition, local post offices will receive and post notices. *Anyone concerned with a project can submit their comments at this time.

5) *Comment Periods and Public Hearings*. IDEM generally allows 21 days for public comment. All comments are received during this timeframe are reviewed and considered. In addition, anyone can request a public hearing. IDEM then determines whether a public hearing is warranted.

6) *Evaluation Factors/Decision Criteria and Imposed Conditions*. In general, IDEM follows a format similar to the *Mitigation MOA*, which the Corps and the EPA use in evaluating 404 permits. Typical areas of consideration and conditions include avoidance and/or minimization of impacts, nature of compensatory mitigation for wetland impacts, establishment of buffer zones around waterbodies, prohibitions on work during certain times of the year, stormwater and erosion control measures, conservation easement and additional monitoring or water quality studies (IDEM 2000).

- *Avoidance*. Part 7 of IDEM's WQC application asks the applicant to "describe possible alternatives to the proposed project". This is designed to encourage the applicant to consider locating their project in another "less sensitive" location. Advantages to considering practicable alternatives include avoiding the permit process and saving time and effort involved with wetland mitigation. If an applicant does not consider avoiding wetland impacts, IDEM may choose to inspect the site to determine if all alternatives have been considered, but this is seldom done.
- *Minimization*. Part 7 also states that an applicant must "describe ways to minimize impacts, including a description of how the project will contain dredged/ excavated material and prevent reentry into waterways or wetlands".
- *Compensatory Mitigation*. If a project will affect more than 0.10 acres of wetlands, or more than 300 feet of a stream channel, the project will be determined to have adverse impacts on water quality. Under this scenario, IDEM requires compensatory mitigation. In-kind and on-site mitigation are preferred and up to 5 years of mitigation monitoring is required. IDEM has set the following mitigation ratios:

    - 1:1 to 2:1 for emergent wetlands and open water (excluding streams or rivers.
    - 2:1 to 3:1 for scrub/shrub and some immature forested wetlands.
    - 3:1 to 4:1 for mature forested wetlands.
    - 4:1 and above for unique or rare wetlands such as bogs, fens, etc.

  * Currently IDEM is proposing new wetland water quality standards and 401 water quality certification implementation procedures that would increase the above mitigation ratios and establish different criteria for wetlands (classified as

either Tier I or Tier II) (IDEM 1999).

- In addition to these standards, 401 applications must also comply with other related laws such as *The National Environmental Policy Act (NEPA), The Endangered Species Act* and *The National Historic Preservation Act (NHPA).* * It should be noted here that IDEM's WQC process complies with NEPA guidelines by 1) Notifying the pubic (through public notice), 2) Coordinating with the public and relevant agencies, and 3) Considering alternatives.

7) *Application Approved or Denied.* Once IDEM has completed its evaluation of the permit application, it either issues the permit or denies it. If approved, the applicant simply signs the application (agreeing to abide by all conditions) and returns it, then the permit is issued. IDEM has established a 60 day time table (from the date IDEM receives the application) in which to process 401 permit applications. Additional time may be necessary if other laws apply, and IDEM can take up to a year to review a project (as stated in the CWA) if it chooses. IDEM can deny a permit for failing to meet any of the decision criteria

8) *Follow up/Monitoring/Remediation.* Upon issuance of a permit, IDEM typically enforces a five year monitoring period. This requires the permittee to provide information on the biological status of the mitigation wetland. Usually data points are established and vegetation are documented by quadrat method. This data is then used to calculate such measures as percent cover, relative frequency, relative dominance, importance value, etc. In addition, measures of the presence or absence of hydrology are recorded and soil samples are collected. These reports are then reviewed by IDEM staff, who determine if the site is progressing towards the proposed wetland type (ie.

forested wetland, emergent wetland, etc.). IDEM staff may also make field inspections to determine if the site has been developed as planned or is progressing as the permitee claims. IDEM usually requires the full five years of monitoring for most sites, however sites can be released early if it is determined that the wetland has met the mitigation goals. Finally, remediation can be required for sites that were constructed incorrectly or are clearly not progressing towards the functioning wetland community type proposed in the application.

These series of steps and procedures serve as general guidelines for the 404 and 401 process in Indiana. However, it should be noted that many projects have their own unique timeline and evolution due to the array of factors that can come up in a permit application process (applicant's financial difficulties, extended timeframes for comments, complexity of environmental issues, change of plans, lawsuits that may arise from permit issuance or non-issuance and delays in permit processing by IDEM and the Corps due to heavy workload and understaffing). Differences of opinion in regards to permit processing/decisions can result in delays. Although 404(b)(1) guidelines and IDEM standards are clearly stated in the law, much of the decision making by IDEM and the Corps is based on professional judgment and Project Manager discretion. Issues often arise in the wetland mitigation process due to this lack of scientific certainty. Some of the more controversial issues include wetland delineations and standards/ requirements for particular compensatory wetland mitigation projects.

Wetland delineations can become points of conflict because defining wetland hydrology, hydric soils, and hydrophytic vegetation is not an exact scientific process. The 1987 Corps delineation manual defines what areas are to be considered jurisdictional or

non-jurisdictional wetlands, but drawing boundaries of wetlands and determining their acreage is often concluded by professional judgment. Thus, conflicts over delineations can arise. For example, agency officials may disagree with a wetland delineation and determine that more acreage for mitigation is necessary. This adds more expense to the applicant's project; therefore, consultants (who complete much of the delineation reports) often challenge the agencies' determination .

Such conflicts cause delays for permits and can even result in lawsuits. In addition, standards and guidelines for compensatory mitigation can become points of contention in the permit process. As has been described, the Corps and IDEM generally prefer in-kind vs. out-of-kind mitigation, on-site vs. off-site mitigation and restoration or enhancement of a wetland vs. creation of a "new" wetland. Also the agencies often require erosion control methods, project design specifications, buffer zones and planting/re-seeding procedures. They may also establish mitigation ratios for different wetland types and set mitigation monitoring compliance standards, etc.

All of these requirements and standards possess gray areas in their application. For example, a consultant may develop a mitigation plan based on his or her experience from a previous project, and be fairly confident in their mitigation outcomes. However, an agency official may still require additional measures. Since wetlands are complex ecological systems and every project involves different variables, there is no way to know for certain what impacts will arise from either the wetland fill or the proposed wetland creation/restoration. Since neither party can be certain of the outcomes, differences in professional judgment often occur between wetland consultants and regulatory agencies. Such disagreements result in permit delays and extended timeframes for the applicants.

Part II: Evaluating Outcomes of Indiana Wetland Mitigation Through Case Studies.

Site Selection

With regard to site selection, a few simple guidelines were used to select wetland mitigation sites assessed in this report. These included time since the site was created/restored, availability of information and access. Selecting sites which have had a reasonable amount of time to develop and perform functions was a priority. Recently created or restored projects have a high percentage of barren ground due to earth work, plantings, etc. Such sites lack the necessary time to develop the capacity to perform wetland functions primarily due to low vegetative diversity. Sites at least 3-5 years old were selected for assessment. Projects of this age are generally considered to have had adequate time in which to develop wetland characteristics and thus perform wetland functions. Therefore assessment of such sites provides a better basis for evaluating the functions and outcomes of the mitigation.

In addition, site selection depended on availability of information. Documenting a site's history requires describing what type of wetland was destroyed and created, when the mitigation occurred, where the sites are and why wetland destruction was unavoidable. Such information comes in the form of mitigation plans, monitoring reports, section 404/401 permits and public notices.This type of information was obtained (when available) for the sites used in the study. Finally, access to sites was taken into consideration. Projects requiring expensive travel were dropped from the study in favor of regional (central Indiana) sites that enabled frequent field inspections. Using these criteria, four sites were selected for the study: *Bear Slide Golf Course, Pebble Brook Golf Course, Little Cicero Creek and Greenwood, IN* (see map on page 40).

Functional Assessments of Created/Restored Wetlands (Methods)

Deciding which evaluation method to use and what criteria were to be evaluated was a difficult process. Functions and values of wetlands include flood conveyance, barriers to waves and erosion, flood storage, erosion and sediment control, pollution prevention and control, fish and shellfish production, habitat for waterfowl and other wildlife (including rare and endangered species), recreation, water supply, food production, historic/archaeological values, education and research, open space, aesthetic values and timber production (Kusler and Opheim 1996). Considering the quantity and diversity of these functions and values, an evaluation method which assesses all of these criteria in a short period of time is unrealistic. Therefore I identified specific goals and objectives to assess and then selected an appropriate method to achieve these goals.

An array of different wetland evaluation methods exist which measure many different criteria/variables (Bartoldus 1999). Some of the variables measured include: success, effectiveness, impacts, suitability for local target species, physical, chemical and biological functions of wetlands, and health. Some are based on using reference sites, others use very technical measurements, some are coarse-filters while others act as fine-filters, finally some are very time consuming and data intensive, while others can be completed in a few days with proper training.

For this study several factors directed the selection of an assessment methodology. Specifically, the method chosen needed to be relatively rapid (can be completed in a short time frame and is not too data-intensive), inexpensive, replicable, scientifically based, easily learned and based on functional indicators which can be used in mitigation site assessment. In addition, I wanted a method that was widely used and recognized, with

measurable goals that I accept and access to detailed written protocols as well as experienced mentors who can answer my questions and provide guidance. Using these selection criteria, the Wisconsin DNR Rapid Assessment Methodology (WIRAM) method was chosen.

This method was developed by the Wisconsin Department of Natural Resources (WDNR) for use with its water quality certification program (section 401 of the Clean Water Act). Under this program, agency personnel make decisions on over 500 projects per year. Such a large number of projects demands a simple, time-efficient methodology, which is defensible, (both legally and scientifically) and can be completed after limited site visits.

WIRAM is a field checklist that requires investigators to focus on important indicator attributes of the wetland and watershed. Using this methodology, the evaluator can document location information, wetland type, seasonal conditions, hydrologic setting, soils, vegetation communities and surrounding land uses in the watershed. The functional value assessment portion requires the evaluator to examine site conditions that provide evidence that a given function is present and to assess the significance of the wetland in providing those functions (WDNR 1992). The methodology looks at the following functional values:

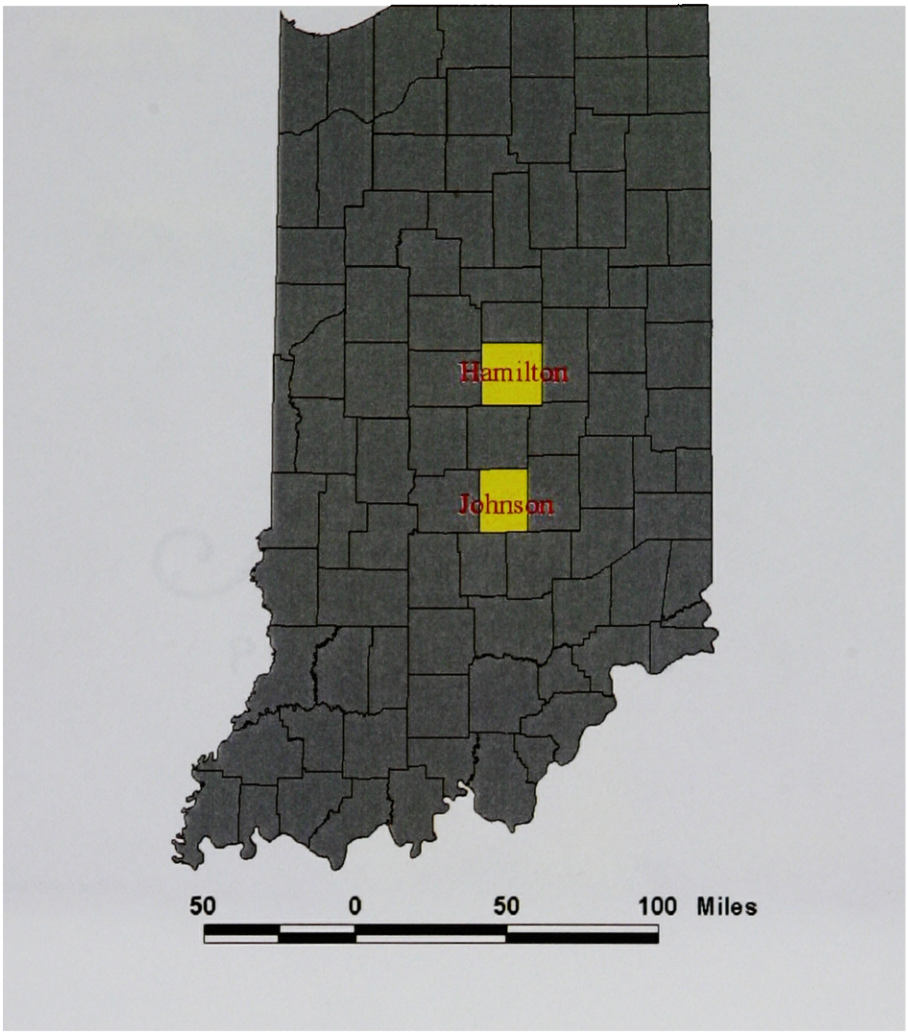
- Special Features (located in or near state natural areas, state parks, wild and scenic rivers, etc.
- Floral Diversity
- Wildlife and Fishery Habitat
- Flood and Stormwater Storage/Attenuation
- Water Quality Protection
- Shoreline Protection
- Groundwater Recharge and Discharge
- Aesthetics/Recreation/Education and Science

To complete the evaluation procedure, the site evaluator reviews existing data sources, visits the area, and answers questions that indicate the presence of factors important for each functional value. The answers to questions are used as a guide in rating the significance of each functional value for a wetland. After completing each section, the evaluator considers the factors observed and uses best professional judgment to rate the significance. Possible ratings include: low, medium, high, exceptional and not applicable (Bartoldus 1999). The result is a listing of the important wetland functional values and documentation of the landscape features that led the evaluator to that decision (WDNR 1992). This method was selected for the study because it met all of my criteria. In addition, WDNR staff determined that there are enough ecological similarity between Wisconsin and Indiana wetland landscapes to justify applicability in this state.

Sources for guidance in the application of this method include: 1) *The Minnesota Routine Assessment Method for Evaluating Wetland Functions (a method based on WIRAM which provides guidance sections),* 2) *The Coastal Wetlands of Manitowoc County: Inventory, Assessment and Management Recommendations (a study by the University of Wisconsin, that includes an adapted WIRAM and application guidance sections)* and 3) Personnel at the Univeristy of Wisconsin and WDNR.

The following sections describe the results of the WIRAM assessments on each site. Included in each analysis are brief histories of the sites' mitigation and descriptions of the WIRAM results. Results for the Bear Slide Site will appear first followed by Pebble Brook Golf Course, Little Cicero Creek and the Greenwood site (Figures 1 & 2 show location of sites).

Location of Sites in Indiana



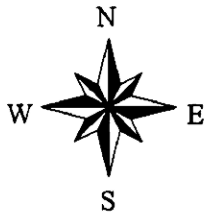


Figure 1

County Location of Sites
(Central Indiana)

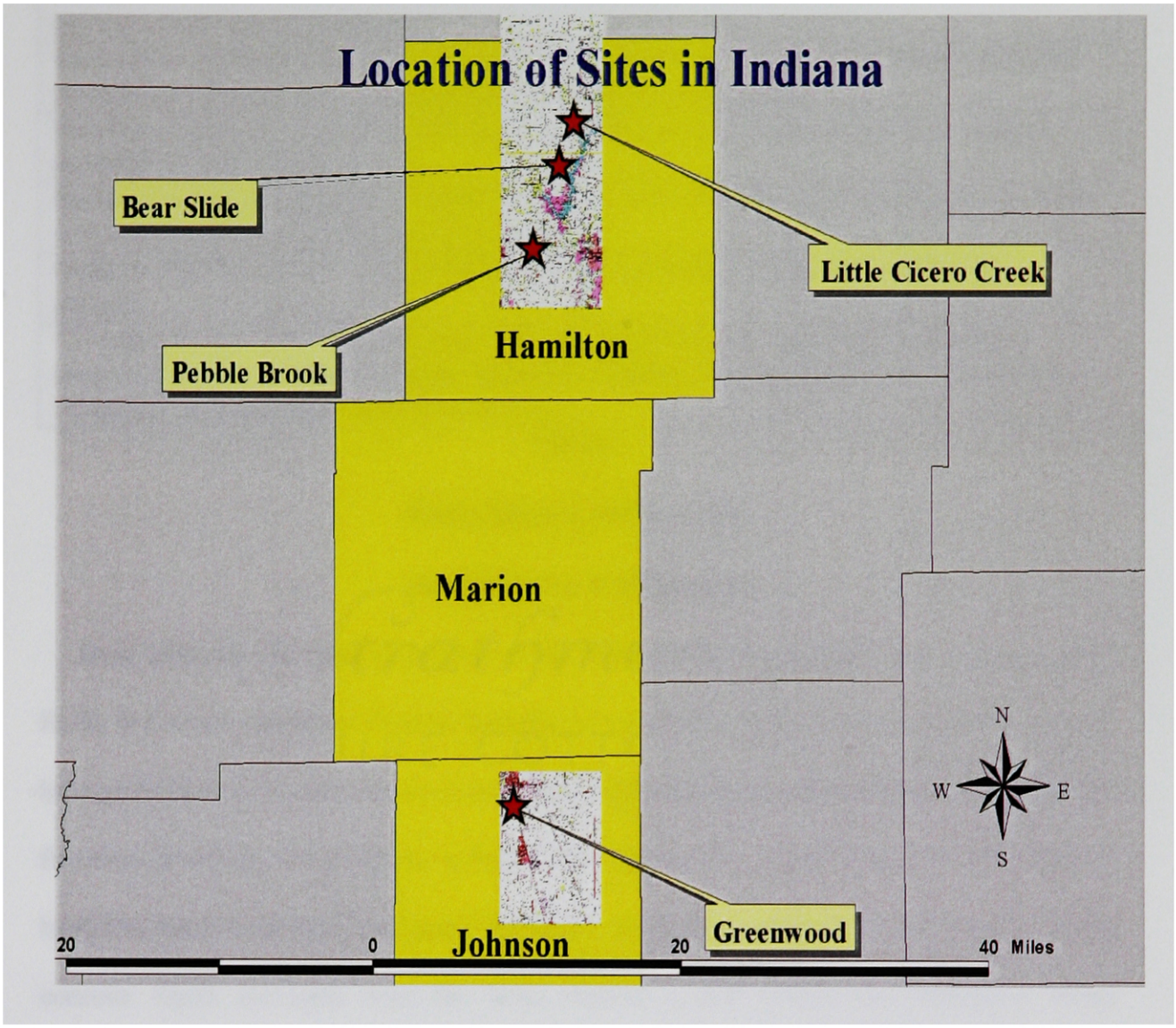


Figure 2

Location of all Sites
(Central Indiana)

Case Studies:

Obligate Wetland (OBL) – Occur almost always (estimated probability >99%) under natural conditions in wetlands
Facultative Wetland (FACW) – Usually occur in wetlands or non-wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
Facultative (FAC) – Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
Facultative Upland (FACU) – Usually occur in non-wetlands, but occasionally found in wetlands (estimated probability 1%-33%).
Obligate Upland (UPL) – Occur almost always (estimated probability >99%) in uplands.
* Plants that are OBL, FACW, and FAC (except FAC-) are considered wetland species. Positive or negative signs indicate a tendency toward higher (+) or lower (-) frequency of occurrence within a category.

Table 1

Bear Slide Golf Course

Brief History of Mitigation

Bear Slide Golf Course is located on the Noblesville Quadrangle, Sec. 2 & 3, T 19N, R 4E, in Cicero, Hamilton County, Indiana (see page 89). Prior to its conversion to an 18-hole golf course, the area was used as a farm, with cattle grazing representing the primary function. Bisecting the property is Bear Slide Creek. This small creek is surrounded by beautiful hardwood trees and small wetlands, which are adjacent to the creek's rolling contour. Upon purchase from the farm owners, a golf course was designed, which bisected the creek and wetland areas with several holes and possessed an array of mounds and hills for a "links style" front nine holes. Due to the bisecting of Bear Slide Creek (with cart bridges) and the adjacent wet areas (fills proposed), a wetland delineation report was conducted (by Earth Source, Inc.) for the project.

This report identified several acres of wetlands within the boundaries of the proposed golf course. Earth Source, Inc. advised the developer to make project modifications to reduce impacts to the wetland areas. This was completed, but some impacts were

determined to be unavoidable. Therefore, permit applications were submitted to the Louisville District Army Corps of Engineers for a section 404 permit. On November 15, 1991 the Corps determined "that the proposed work for the fill/excavation of 0.09 acre of wetlands is authorized under the provisions of Nationwide General Permit 33 CFR 330.5(a)(26)(i), eliminating the need for further processing for discharges which affect less than 1 acre of waters of the United States, including wetlands that are isolated or located above headwaters". The USACE then issued a "Nationwide 26" permit for the Bear Slide project with special conditions. These special conditions stated that wetland mitigation should be provided.

As a result of these conditions, an on-site, created wetland was proposed as compensation for the fill areas (it could not be ascertained, from the project files, if the wetland mitigation was in-kind or out-of-kind, but it is assumed that the created site is similar to the wetlands filled (emergent/sedge meadow) due to its close proximity and similar setting). This plan was approved by the USACE, and a 1.5 acre wetland was created adjacent to the 18th hole. The created site was located next to Bear Slide Creek at the bottom of a small ravine. The mitigation wetland was constructed a short distance from other small wetlands within the creek basin and ravine draw. Due to the sites' close proximity to these wetlands, seed drift occurred and the site was released by the Corps after four full years of monitoring in August of 1997. The Louisville USACE district typically requires five years of mitigation monitoring compliance. However, the Corps agreed with the monitoring report (contents described in step 8 of agency permit process), which stated that the site had developed into an early successional emergent/sedge meadow wetland community with high vegetative diversity and percent cover (Earth

Source 1996).

Description of WIRAM Results
(WIRAM data forms and results are presented in Appendix A, Page 79)

Outcomes from the WIRAM analysis on the Bear Slide mitigation wetland indicate that the site is doing well in several functional categories. Specifically, in my best professional judgement, the site is exceptional for floral diversity, high for wildlife habitat, flood/stormwater attenuation and water quality protection. I rated groundwater recharge/discharge medium while fishery habitat and aesthetics/recreation/education categories were rated as low. Shoreline protection was not applicable since the site is not directly within a riparian system. Also, the assessment did not identify any special features or red flags.

I rated vegetative diversity exceptional due to the identification of an array of native and obligate wetland species. Plants identified included (Refer to Table 1 on page 41 for plant classification system):

- Dark Green Bulrush *(Scripus atrovirens)* OBL
- Giant Manna Grass *(Glyceria grandis)* OBL
- Cattail *(Typha angustifolia)* OBL
- Wool Grass *(Scirpus cyperinus)* OBL
- Boneset *(Eupatorium perfoliatum)* FACW
- Fragrant Goldenrod *(Solidago graminifolia)* FACW-
- Willow *(Salix exigua)* OBL
- Rice Cutgrass *(Leersia oryoides)* OBL
- Sedges *(Carex sp.)* OBL – FAC

The listed species are dominants on the site; however, monitoring reports have documented numerous other hydrophytes as well. Neighboring the site is an area of natural wetlands, which has likely resulted in seed drift to the mitigation site. In addition, the area was seeded (during construction) with an array of native vegetation (several of which are listed above) and wetland hydrology has been established on the site. All of

these factors have contributed to the floral diversity of this emergent/sedge meadow wetland.

I rated wildlife habitat high due to the floristic diversity of the site and it's proximity to other wetland habitats and a forested area adjacent to Bear Slide Creek. Species such as raccoons, squirrels, ground hogs, opossum and various birds likely benefit from the wetland. Flood and stormwater attenuation was also rated high due to the site's diverse vegetation and location between steep slopes and Bear Slide Creek. The wetland likely catches sediment and pollutants (from golf course maintenance) as they wash down the slopes, filtering them out before they enter Bear Slide Creek (monitoring reports reveal consistent ponding of water on the site (Earth Source 1999)). This function also benefits the water quality of Bear Slide Creek, which also received a high rating.

Groundwater recharge/discharge received a medium rating. No visible springs were documented and the system appears to receive the majority of its water from overland flow. In addition, the small size of the wetland minimizes effects on groundwater recharge/discharge. Fishery habitat was rated low, while aesthetics/recreation/education benefits were given a medium designation. The wetland does not possess any deep pools, but does appear to have an ephemeral surface water connection to Bear Slide Creek; therefore, it may provide some fishery habitat. Finally, the site is located adjacent to a golf course, thus there is a recreational/aesthetic benefit to golfers; however, there is currently no educational use of the site.

Taking all of these factors into account, the Bear Slide site appears to be progressing towards a highly functional wetland. Constructed in 1992, the site has had roughly eight years to develop. During that time, the wetland has recruited a diverse and native

hydrophytic plant community (with few exotic species), appears to be consistently saturated (as documented in monitoing reports) and possesses characteristics of hydric soils (mottling). The design of the site and its proximity to other wetlands has benefited its development. Overall the wetland appears to be a positive addition to the landscape.

Pebble Brook Golf Course

Brief History of Mitigation

Pebble Brook Golf Course is located on the Noblesville Quadrangle, T 19N, R 4E, Section 28 & 33, north of State Road 32, near Noblesville, Hamilton County, Indiana (see page 102). Much of the area was used for agricultural purposes before being converted to a 36 hole golf course community. The area was most likely used for soybean and corn production. Sly Run creek meanders through the property with several wetland areas lying adjacent to it and other wetlands located throughout the property. Initially an 18 hole golf course was developed with condominium complexes lying adjacent to the course, but other additional developments followed, including another 18 hole golf course, housing communities and an expanded pro shop.

The Estridge Group (developers) wanted to open up another section of the property (along the west boundary) for a small housing community in early 1993. Due to the presence of wet areas within the project design, Earth Source, Inc. was hired to conduct a wetlands delineation. This delineation determined that there were a total of 11.5 acres of jurisdictional wetlands within the assessed areas. The Estridge Group then considered alternatives to the site and minimized the wetland impacts, but 0.89 of an acre was determined to be unavoidable and necessary to fill for the construction of an entrance road and several development pads. Therefore Earth Source, Inc. was hired to obtain permits for the project and develop any necessary mitigation wetlands.

Both 404 (Army Corps) and 401 (IDEM) applications were submitted. On March 19, 1993 the Louisville District Army Corps of Engineers stated that "the proposal to fill 0.89 acre of headwaters and isolated wetlands is authorized under the provisions of

Nationwide General Permit (NWP) 33 CFR 330 Appendix A, Part B (26) for discharges which affect less than 1 acre of waters of the United States, including wetlands". They concluded that an individual permit was not necessary provided the project complied with General Conditions and the proposed Mitigation Plan (by Earth Source). In regards to 401 WQC, IDEM determined "that the proposed mitigation will adequately replace the wetland functions and values lost as a result of the proposed project. Therefore, subject to conditions, the office grants section 401 WQC" (March 9, 1993).

Having obtained the required permits, development of the housing community went forward, and Earth Source began construction of the mitigation wetland. The wetland was created on-site with the goal of developing into a seasonally flooded palustrine emergent/sedge meadow wetland of substantially greater species diversity than the wetlands impacted. According to the delineation report, the wetlands filled were an isolated farmed wetland and a forested riparian wetland (these amounted to .89 acres, all of which were filled for development). Considering this, the mitigation was not in-kind. The created wetland was designed as a series of three descending shallow pools adjacent to a seasonally flooded ditch. The total size of the project was determined to be 1.3 acres. IDEM and the Corps required 5 years of monitoring compliance which ended in the fall of 1999. The monitoring reports concluded that the mitigation area is establishing at the expected rate towards an emergent/sedge meadow wetland community type (Earth Source 1999). Due to the lack of remediation, it can be assumed that the Corps and IDEM concurred with these results.

Description of WIRAM Results
(WIRAM data forms and results are presented in Appendix A, Page 92)

Completion of the WIRAM assessment on the Pebble Brook mitigation site produced

mixed results. Four functional categories received a medium designation (floral diversity, flood/stormwater attenuation, water quality protection, groundwater and aesthetics/recreation/education), while low ratings were given to the wildlife and fishery habitat sections. The shoreline protection function was not applicable on this site. This site received lower ratings than the Bear Slide site because it is surrounded by housing and has poorer habitat.

Through several field investigations, and review of monitoring reports, the floral diversity of the site was evaluated. The following species were identified and represent the dominants on the site. (Refer to Table 1 on page 41 for plant classification system):

- Duckweed (*Lemna sp.*) OBL
- Cattail *(Typha angustifolia)* OBL
- Panic grass (*Panicum sp.*) FACW-FACU
- Cattail (*Typha latifolia*) OBL
- Fragrant Goldenrod *(Solidago graminifolia)* FACW-
- Willow *(Salix exigua)* OBL
- Timothy (*Phleum pratense*) FACU
- Creeping Bentgrass (*Agrostis alba palustis*) FACW

Although many of these species are obligate or facultative wet, overall diversity is not high. This is due, in large part, to the dominance of the site by a few species such as creeping bentgrass and cattails (Earth Source 1999). Flood and stormwater attenuation is not a significant function of this site. Visits to the wetland during spring and fall indicated that the area is not receiving large inputs from stormwater events (it should be noted that the summer of 1999 was very dry, driest summer on record in Indiana in 10 years). The site was designed to receive water inputs through a diversion from a nearby ditch. This water was then supposed to filter down through a series of three descending low shelves, ultimately emptying into a small pond. Monitoring reports from 1995-1999 reveal that the shelves are saturated, but usually below the surface (this indicates that the hydrologic

design of the project was poorly predicted (Earth Source 1999)). Overall, the wetland attenuates little water from flood or stormwater events (the site was observed following a rain event and had little water accumulation).

Since the site receives low hydrologic input, the wetland does little filtering of sediments and pollutants. Considering this, the site received a medium score for the water quality protection. Groundwater recharge/discharge received a low rating. No visible springs were documented and what little water the system does receive comes from overland flow. Therefore the wetland serves a minimal function to the surrounding landscape as a groundwater discharge/recharge source.

A medium rating was given to the aesthetics/recreation/education category. Pebble Brook is a public golf course, and the wetland does possess some scenic attributes. Finally, very little wildlife and fishery habitat is provided by the wetland. As mentioned, vegetative diversity is not high and the system receives little water; therefore, the wetland provides poor habitat for fish and wildlife and does not supply a significant food source. In addition, surrounding the site is a residential housing community, a public golf course (with high traffic) and a narrow strip of forest adjacent to the ditch. Field visits and monitoring reports did not detect the presence of numerous fish and wildlife species, hence the low rating.

Judging by these WIRAM results, the Pebble Brook site appears unlikely to be able to become a properly functioning emergent sedge meadow wetland community without more work. A few factors are likely causing these poor results. In particular, the hydrology of the site was poorly planned. Five years of monitoring indicate that none of the wetland shelves have been inundated at the time of monitoring. With a more

consistent and abundant water supply, vegetative abundance and wildlife habitat would likely improve. Either no water budget for the project was prepared or the diversion channels, grade, elevation, etc. were improperly constructed, because the site does not appear to be functioning as designed. Although there is a preponderance of hydrophytic vegetation, evidence of soil mottling (presence of hydric soils and a portion of the wetland area is at least saturated), the wetland appears to be limited in its ability to perform many functions at a high level. Unless remediation measures are taken to correct the design flaws, it appears unlikely that the wetland will perform functions beyond the low or medium WIRAM level.

Little Cicero Creek

Brief History of Mitigation

This project is located on the Arcadia Quadrangle, T 20N, R 4E, Section 26, in Cicero, Hamilton County, Indiana (see page 115). Two locations were involved in the project: 1) a dredged and filled area located on Morse Reservoir, near the inlet of Little Cicero Creek and 2) the corresponding compensatory mitigation site located upstream adjacent to Little Cicero Creek. The Shorewood Corporation (developers of commercial real estate around Morse Reservoir) dredged a 1.5 acre wetland and discharged the spoils in a wetland area adjacent to the dredging sometime in late 1990/early 1991. Soon thereafter, the Louisville Army Corps of Engineers became aware of this illegal dredge and fill activity and notified the Shorewood Corporation that any further construction was prohibited. The Corps then determined that 2000 cubic yards of dredged material had been discharged into a wetland affecting an area of unknown size. This fill was determined to be in violation of section 326.3 of Title 33 CFR. Thus, Shorewood was required to apply for an After-the Fact (ATF) permit from the Corps (no fine was mentioned in the record).

This ATF application was determined to be unsatisfactory unless Shorewood developed a compensatory mitigation plan. Dan Willard of Indiana University was then consulted to prepare such a plan for Shorewood. The resulting scheme proposed to restore 14.5 acres of a drained agricultural field located half a mile upstream from the wetland fills adjacent to Little Cicero Creek. This proposal was then included with applications to IDEM and the Corps for ATF permits. Both IDEM and the Louisville District ACE approved the plan and issued permits in the spring of 1991. Restoration of

the mitigation wetland soon followed.

According to the plan designed by Willard, drainage tiles would be removed and plugged, then the former agricultural field would be graded to create two descending shallow wetlands. The hydrologic design included the excavation of material adjacent to Little Cicero Creek in order to divert high water into the wetland areas. The two wetlands were to be surrounded by small berms to hold the water with a levee between the two sites. Water control structures were located between the wetlands and at the south end of the site to allow flow between the wetlands and back into the creek. Willard envisioned the site to progress through successional stages (palustrine emergent, scrub/shrub) and ultimately develop into a palustrine forested wetland with a species composition similar to the adjoining mixed floodplain hardwood forests into the area. The mitigation was considered on-site (within the same watershed), but could not be considered in-kind since the palustrine emergent wetlands filled were to be replaced by a palustrine forested wetland. A three year monitoring program was also included in the proposal.

The project files did not include monitoring reports and it appears that no remediation was required for the site (i.e. no replanting or regrading). IDEM and the Corps approved of the restoration and its progression after the monitoring period. Upon completion of the project, Shorewood donated the site to a group of duck enthusiasts who took over the management of the wetlands. This group has since installed wells on the site to control the water levels of the two shallow wetlands. The wetlands are filled in the spring and the fall to attract ducks to the area. In addition, the site is regularly mowed to control exotic plant growth, thus it never matured into the palustrine forested wetland that Willard envisioned. Instead a palustrine emergent wetland with some scrub/shrub habitat has

developed (personal communication with Bill Coors), which is apparently acceptable to the Corps.

Description of WIRAM Results
(WIRAM data forms and results are presented in Appendix A, Page 105)

The wetland restoration site near Little Cicero Creek generally received a favorable review from the WIRAM. The floral diversity, wildlife habitat, flood/ stormwater attenuation and water quality protection categories were given high designations. Groundwater discharge/recharge, shoreline protection, fishery habitat and aesthetics/ recreation/education all received medium ratings.

A variety of wetland plant species were identified within this 14.5 acre, seasonally flooded basin. Thus, the site received a high rating for the floral diversity category. The wetland and plant community are typical of an emergent sedge meadow. Species identified on the site included (Refer to Table 1 on page 41 for plant classification system):

- Reed Canary Grass *(Phalaris arundinacea)* OBL
- Queen Anne's Lace *(Daucus carota)* FACU
- Cattail *(Typha latifolia)* OBL
- Black Willow *(Salix nigra)* OBL-FACW
- Spike Rush *(Eleocharis obtusa)* OBL
- Arrowhead *(Sagittaria latifolia)* OBL
- Swamp Milkweed *(Asclepias incarnata)* OBL
- Ditch Stonecrop *(Penthorum sedoides)* OBL
- Monkey Flower *(Mimulus ringens)* OBL
- Sedges *(Carex sp.)* OBL-FAC
- Rice Cutgrass *(Leersia oryoides)* OBL

These species represent the dominant cover types; numerous other species were also identified on field visits. The only reason the site did not receive an exceptional rating was due to the presence of the invasive/exotic: Reed Canary Grass *(Phalaris arundinacea)*. This plant is well established on the surrounding levees of the wetland and

would likely invade the interior wetland areas if not managed. However, seasonal mowing by the owners seems to be keeping the plant at bay.

The wetland also provides excellent wildlife habitat for a variety of species within the forested Little Cicero Creek area. Various birds, waterfowl, frogs and deer were identified during field visits. The high vegetative diversity, consistent water supply and adjacent undeveloped forested areas enhance the sites' habitat values. It also appears that the wetland is part of a wildlife corridor for deer, raccoons, opossum, etc.(trails and tracks were identified along a section up and downstream of the site following Little Cicero Creek). As with the Bear Slide site, this wetland is located between steep slopes and a creek. The wetland likely catches sediment and pollutants (due to the dense and diverse plant communities) before they enter Little Cicero Creek. This function contributes to the improvement and protection of water quality within the area, thus a high rating was awarded for the water quality protection category.

No springs were identified within the wetland; however, groundwater wells pump water to fill the wetlands in spring and fall (due to owners desire for duck habitat). Some of this water likely discharges back into the aquifer. Considering this, a medium score was given to the groundwater discharge/recharge category.

The site also provides some shoreline protection as well (medium score). Due to the wetlands close proximity to Little Cicero Creek, it can be considered a riparian type system. The dense vegetation (including willows between the creek and wetland) helps to stabilize the creek banks. The site was originally designed to divert high water from Little Cicero Creek to fill and saturate the two meadows. This plan changed when a group of duck conservationists acquired the site from the Shorewood Corporation (as prescribed in

the mitigation plan). The seasonal flooding was not adequate to fill the wetlands to desired levels for the owners; therefore, they installed wells and artificially fill the wetlands in spring and fall. Regardless, the site is still susceptible to highwater flooding from Little Cicero Creek. As a result, the wetland may provide some fishery habitat value (low rating). Finally, a medium score was given for aesthetics/ recreation/education. Although the site is not accessible to the public, the wetland has great aesthetic qualities. In addition, it would make an excellent location for field studies by local school groups, etc. However, the current ownership prohibits trespassing.

Overall this wetland has developed into a highly functioning emergent sedge meadow wetland with some scrub/shrub habitat. Although the original design envisioned the area going through a series of successional stages, ultimately maturing into a palustrine forested wetland, the wetland has significant value. Current management ensures that the areas are seasonally inundated with water and invasive species are controlled through mowing. The 14.5 acres provides important habitat to a variety of species living within a fairly protected forested plain adjacent to Little Cicero Creek. Other wetlands in the area have either been filled or are overrun with Reed Canary Grass, thus this wetland benefits the surrounding landscape in many ways.

Greenwood Site

Brief History of Mitigation

This wetland mitigation site is located on the Greenwood Quadrangle, T 13N, R 4E, Section 5, in Greenwood, Johnson County, Indiana (see page 128). In the fall of 1992, the National Bank of Greenwood (NBG) acquired this small piece of property, which possessed a pond and some wet areas. Due to its marketable location, NBG decided it would like to modify the property in order to sell it to a potential commercial developer. In order to facilitate future development, a portion of the wet areas needed to be filled. Therefore a wetland consultant was contracted to complete a wetland delineation on the site and obtain any necessary permits for the proposed impacts. The delineation (completed by SD Huckleberry & Associates) determined that 0.94 of an acre of wetlands existed on the property. The delineation report noted that the area may have been somewhat larger in years past, but alterations occurred prior to 1971. According to National Wetland Inventory maps; this isolated wetland was classified as a palustrine emergent wetland that is seasonally flooded during portions of the year. Realizing that the proposed modifications would impact the wetland, appropriate applications were submitted to the Corps to determine if a 404 permit was required and IDEM for 401 WQC.

The initial application for WQC was denied by IDEM. In this denial (dated December 7, 1992), IDEM noted that the project did not meet the 404(b)1 guidelines of avoidance, minimization and mitigation. On December 15, 1992, SD Huckleberry & Associates submitted plan modifications to IDEM. This plan included the excavation of the existing wetland to create a stormwater retention pond. In considering this modified proposal,

IDEM stated in a letter dated January 28, 1993 "that the existing wetland is a low quality, periodically mowed, cattail-dominated wetland. The proposed basin will consist of a 0.68 acre open water, floating aquatic, and emergent wetland complex. While the wetland will be reduced by 0.26 acres, the resulting complex will be of greater diversity and higher water quality value than currently exists". IDEM accepted this plan and granted WQC.

This was a surprising decision considering that 404(b)1 guidelines and standards included in the *Mitigation MOA* call for a "no net loss" of wetlands and at a minimum 1:1 mitigation ratio. Regardless, IDEM let the project go forward and considered it an enhancement, on-site, in-kind compensatory mitigation project. NBG moved forward with the filling of the wetland areas and sold the property (it now possesses a gas station and a temporary mini-warehouse facility). Records of Louisville District Army Corps decisions could not be obtained. However, considering the size of the project and quality of the wetland, a Nationwide 26 permit was likely issued. In addition, monitoring reports could not be located for the project. Therefore, it is not known if monitoring compliance occurred on the site or if remediation measures were taken. However, site visits confirm that the wetland was filled and the proposed .68 acre open water, floating aquatic, and emergent wetland complex type was attempted.

Description of WIRAM Results
(WIRAM data forms and results are presented in Appendix A, Page 118)

WIRAM results for the Greenwood site indicate that the wetland lacks the ability to perform functions at a high or exceptional level. The wetland received low ratings for the floral diversity, water quality protection, wildlife habitat, aesthetics/recreation/education and groundwater discharge/recharge categories. Results were only slightly better for fishery habitat (medium) and flood/stormwater attenuation (medium). The site is not

connected to another body of water so the shoreline protection category was not applicable.

Few plant species were identified at the wetland. These included (Refer to Table 1 on page 41 for plant classification system):

- Cottonwood *(Populus deltoides)* FAC+
- Cattail *(Typha latifolia)* OBL
- Softstem Bulrush *(Scriptus validus)* OBL
- Willows *(Salix exigua)* OBL
- Fragrant Goldenrod *(Solidago graminifolia)* FACW-

These plants represent the dominant species and inhabit a narrow strip around the pond. A deep-water plant community was designated for the site, but no aquatic species could be identified during visits. As a result of these factors, the wetland received a low score for the floral diversity criteria. Due to its small size, lack of a visible outlet, algal blooms and other signs of nutrient loading, the wetland's deep-water habitat likely provides poor fish habitat. No fish life was detected during field visits and a visible film covered portions of the pond areas. However, frogs were identified and the pond area is deep enough to support fish, therefore a medium rating was given to the fish habitat category. Due to these problems, the wetland also received a low score for water quality protection. The property adjacent to the wetland has a great deal of pavement and automobile traffic. In addition, a culvert empties into the wetland on the south side. Any residues, oil, waste, etc. on these surfaces quickly runs off into the pond during stormwater events reducing its water quality.

No springs or seeps appear to be present within the wetland, thus the wetland does not contribute significantly to groundwater discharge/recharge. The aesthetic, recreational and educational values of the site are low as well. Surrounding the site are an automobile

dealership, a gas station, a storage facility and a trailer park. There are few trees in the area and high traffic volume from a nearby highway. All of these factors combine to make this a poor recreational/aesthetic area and of little value as an interpretive/educational wetland for groups.

The wetland does appear to provide some wildlife habitat to birds, fish and frogs. However the overall size of the habitat (0.68 acre), its proximity to the adjacent land uses, low vegetative diversity and indications of pollution make it a poor habitat for wildlife. Finally the wetland does provide some value to the surrounding landscape as a flood/stormwater attenuator (medium). Runoff from the nearby parking lots and pavement collects in the basin, eliminating the potential for flooding or ponding in these areas.

In general, this wetland did poorly on the WIRAM assessment. From this analysis, it can be concluded that the wetland provides few benefits (functions) to the surrounding environment. Project goals were to develop an open water, floating aquatic and emergent wetland complex. Constructed in 1992, the wetland has yet to develop a floating aquatic plant community and the emergent areas are merely thin strips of vegetation on the banks of the pond. In its permit decision, IDEM determined that the project would result in a wetland of greater diversity and higher water quality than the filled areas. Thus it approved the filling of wetlands at a less than 1:1 ratio.

This resulted in a net-loss of wetlands in the area. In addition to this loss, the project never developed the attributes that the consultant predicted. No monitoring reports were found in the state file, so it is assumed that little inspection has occurred at the site since construction. If field visits had occurred, it would have become obvious that the wetland

was not developing as prescribed and remediation could have been required. In its current state this project failed in its goal of developing a highly functional emergent/aquatic wetland.

Discussion

WIRAM

From these results I conclude that the WIRAM method possesses strengths and weaknesses in its ability to assess the health/function of wetland mitigation sites. As with many other wetland assessment methods, WIRAM requires the evaluator to use his or her best professional judgment in answering many of the checklist's questions. Thus WIRAM may yield different results, depending on the evaluator/evaluators areas of expertise/training. In addition, the quality of the evaluations appears to be inversely related to the amount of time available to complete the assessments. WIRAM states that it should take only four hours to complete an entire site assessment. However, in completing the evaluations for this study, I made several field visits/investigations (at least 3 for each site), discussed the project with relevant consultants, site stewards and agency personnel and reviewed permit applications, mitigation plans, Soil Survey & National Wetland Inventory maps, and mitigation monitoring reports. Even with all of these resources and field documentations, many sections of the method were still difficult to complete accurately and each assessment required around 10-15 hours (entire assessment) to complete. I question whether a meaningful evaluation could be completed in less time.

In addition to these concerns with the method, I also encountered specific problems with questions/sections in the assessment. These include: 1) Wildlife habitat is difficult to evaluate with limited field visits; 2) Flood and stormwater storage/attenuation cannot be accurately depicted without observation of stormwater events or data collected during

stormwater events; 3) Groundwater recharge and discharge is difficult to determine without groundwater wells/data or specific skills or training with wetland hydrogeology.

Despite these weaknesses, WIRAM did provide valuable information on the four sites assessed in this study. The evaluation of wetland function (floral diversity, wildlife habitat, fishery habitat, flood/stormwater attenuation, water quality protection, shoreline protection, groundwater recharge/discharge and aesthetics/recreation/ education) yielded a useful analysis of the mitigation sites' health/function. To determine whether these mitigation projects successfully replaced the destroyed wetlands they were designed to replace, requires information about the filled wetlands. Unfortunately, such information was not collected before they were destroyed.

The approach and design of WIRAM focuses attention on the most critical information needed to evaluate wetland mitigation projects. This relatively quick assessment method would be particularly useful for wetlands proposed for fill. Such sites are usually filled within a short time after the permit application, so data-intensive/multiple-season (quantitative) assessments were not possible. Currently, assessments on proposed fill sites are rarely completed. Methods like WIRAM could provide agency personnel with valuable qualitative information on the type of wetland filled and the functions it likely performed. These assessments could then be used for reference/comparison with future WIRAM assessments on compensatory mitigation wetlands. State and federal wetland regulatory agencies should require such assessments on proposed fill sites in order for more comprehensive mitigation evaluations to be completed. Such an assessment would add little additional time to the permit application process. However, functional assessments based on multiple visits over several critical

seasons could add a year to the permit process. Still it is questionable whether wetlands would really be protected by using such assessments, which often do not accurately assess lost functions.

Case Studies

From the WIRAM assessments performed in this study, it appears that the Bear Slide and Little Cicero Creek sites perform multiple wetland functions at a high level, while the Pebble Brook and Greenwood sites are much more limited or impaired in their function.

The Bear Slide and Little Cicero Creek sites share some similarities in their success. Both are situated in floodplains adjacent to creeks, both are near the bottom of steep slopes (catching surface water run-off). Both are 8-9 year old on-site mitigation projects and were either restoration projects or located next to established natural wetlands. In the case of the Little Cicero Creek site, the area was likely a bottomland hardwood or floodplain forest before being converted to a small agricultural field. Therefore, replicating wetland characteristics was more of a restoration project than a creation project. Specifically, the area was prone to seasonal flooding from Little Cicero Creek (a hydrologic regime was established), hydric soil characteristics (or redoximorphic features) were likely present, and wetland vegetation (or hydrophytes) were located in the area (and possibly in the seed bank), enhancing the project's chances of success. In addition to these factors, active management occurs on the site (artificial flooding and exotic plant control), which improves, and maintains, wetland characteristics/functions.

The Bear Slide Golf Course mitigation wetland was an in-kind and on-site wetland located in the immediate vicinity of natural wetlands in the Bear Slide Creek floodplain. Although the project was considered a wetland creation, the site is located less than 50

feet from other wetlands, thus very little excavation and grading were necessary to replicate the profile of the other wetlands. Like the Little Cicero Creek site, the area is prone to seasonal flooding, the soils possess redoximorphic features, and hydrophytic vegetation is established nearby, providing a seed source. In addition, the consultant used transplanted seed banks from nearby wetland fills to aid in wetlands development. All of these factors combined to improve the chances of success for the project.

These similarities between the sites tend to support the view that restoration projects have a better chance of success than do created wetlands (Roberts 1993, Kusler and Groman 1986 and Clupek 1986). Both sites are performing several wetland functions valuable to their local environment and appear to have the potential to continue to make progress towards a higher level of function.

The Pebble Brook and Greenwood sites share few similarities other than their poor results from the WIRAM assessments. The Pebble Brook wetland is a created project that performs few wetland functions at a minimal level. This appears to be a result of poor project design and lack of remediation. Specifically, five years of monitoring indicates that the hydrology of the wetland is not appropriate, or sufficient, to support the planned emergent type wetland. 1999 was a drought year and the site was extremely dry; however, the wetland was saturated during a visit in the spring of 2000 (after some rain). Monitoring reports suggests that the site is rarely inundated with water (Earth Source 1996). It is quite possible that the drainage from the nearby ditch is not sufficient to fill the wetlands. Also the grade and size of the retention basins could be inappropriate for the available hydrology in the area. The site was released from future monitoring in 1999, but the site does not possess high vegetative diversity and has some monotypic stands of

cattails. A jurisdictional delineation would determine the area to be a wetland; however, the site cannot be considered a highly functional wetland. Remediation measures to improve the site's hydrology (slight regrading of area to catch more water from ditch and flow between the three basins) should have been required. This step may have provided the site with a slightly higher functional capacity. Finally, this project seems to support the theory that hydrology is often the most difficult wetland characteristic to replicate; hence creation projects tend to be less successful than restoration projects (Fennessy 1997, Bedford 1996, Roberts 1993, and Clupek 1986).

The Greenwood mitigation wetland had the poorest WIRAM results. The majority of functions evaluated on the site received a poor rating. This stems from several problems on the site. First, the floating aquatic plant community (which was a key ingredient to the project's acquisition of a 401 permit) never developed. The site was constructed in 1993, but no floating aquatic vegetation could be identified during 1999 and 2000 field visits. Second, the wetland areas that did develop are limited to a thin strip surrounding the pond and have low vegetative diversity. Third, the wetland appears to have no outlet, possesses trash, algal blooms and a scum-like film on parts of the pond's surface, indicating poor water quality. Finally, the wetland is poorly located. The surrounding land uses are largely commercial, and the wetland is only 10-15 feet away from pavement. The site has little buffering and poor potential to become a highly functional wetland habitat.

No monitoring reports were located for the site, indicating that the project received little follow-up by IDEM and the USACE. If they had visited the site, they would have realized that the aquatic community was not developing, and remediation could have been required to improve water quality, flow, and establishment of a deep water plant

community. Sadly, the mitigation also resulted in a net loss of wetlands due to the filling of adjacent wetland areas for a stormwater retention pond.

In general, the results of these WIRAM assessments provide a mixed message on the outcomes of wetland mitigation in Indiana. Bear Slide and Little Cicero Creek did well on the WIRAM and appear to be well-established and progressing wetlands. Permit goals for the Bear Slide site were to create an emergent/sedge meadow wetland community; however, a sedge dominated plant community has not developed to date. Although sedges are present, other species dominate. Regardless, the site possesses a diverse plant community and performs many wetland functions. Original goals for the Little Cicero Creek project were to have the site go through a series of successional stages before reaching a palustrine, forested climax community. The present plant community resembles more of an emergent/sedge meadow, and the site is managed to attract ducks rather than reach its climax community. Overall, the site still did well on the WIRAM and appears to be a positive addition to the landscape, regardless of not reaching its permitted goals.

Earth Source, Inc. designed the Pebble Brook mitigation wetland as an emergent/sedge meadow; however after five years of monitoring, Carex species still do not dominate the wetland. Instead Creeping Bentgrass and Duckweed are the dominants (Earth Source 1999). Other problems exist on this site and indicate that the project's objectives have not been met (hydrology inadequate for design). Finally, the initial goals for the Greenwood project were to establish an open water, floating aquatic and emergent wetland complex. In addition, IDEM staff permitted the project even though it involved a reduction in wetland acreage (from 0.94 to 0.68), because they believed the resulting

complex would be of greater diversity and higher water quality . WIRAM results indicate these goals were not achieved: 1) a floating aquatic plant community has not developed to date, 2) water quality does not appear to be high (visible film and trash on portions of the wetland), 3) plant diversity is low, and 4) the site received low ratings in four functional value sections.

USACE and IDEM Procedures/Enforcement

Like WIRAM, wetland regulation in Indiana has both good and bad characteristics. Although policy and law attempt to conserve wetlands, enforcement and application of these laws and policies are often deficient. For example, wetland regulatory policy states that there should be a "no net loss" of wetlands in the US, but the Greenwood mitigation project allowed a net loss of wetland acreage (-0.26). Another example of wetland loss comes from IDEM's own mitigation study, which revealed that between 1986 and 1996 nearly 35% of promised mitigation sites were not even constructed (Robb 2000). In addition, no monitoring records were found for the Bear Slide and Greenwood sites. Finally, the Greenwood and Pebble Brook projects have not developed into the type of wetlands proposed in the mitigation agreement yet no remediation measures appear to have been prescribed for either site.

My discussions with the IDEM mitigation coordinator (James Robb) and experience with the completion of mitigation compliance reports for a wetland consultant (including visiting an additional 11 mitigation wetlands of various ages) also suggests that more than 50% of mitigation projects possess problems or impairments in their ability to perform wetland functions. In addition, an array of studies and reports indicate that wetland mitigation more often fails than succeeds (Zedler and Callaway 1999, Metz

1998, Fennessy 1997, Mitsch and Wilson 1996, Race and Fonseca 1996, Williams 1995, Roberts 1993, and Kentula, Sifneos, Good, Rylko and Kunz 1992). All of this suggests that agencies are permitting poor mitigation projects and not tracking projects effectively. Wetland mitigation will be of no use if agencies do not enforce regulations adequately. While projects are sometimes successful (Bear Slide site), proper procedures and enforcement must be carried out on all sites in order for policies to be effective.

On a positive note, IDEM and the USACE have recently taken some steps that appear to strengthen the protection of wetlands and set stricter guidelines for mitigation. Some of these steps are breifly discussed below:

In the spring of 1999, IDEM formed a wetlands workgroup, which was given the task of reforming wetland water quality standards and section 401 water quality certification. By early 2000, this workgroup finished a draft of this report. Under the proposed new guidance, wetlands would be classified, for regulatory purposes, as a Tier I or Tier II wetland. Tier II wetlands would be considered an outstanding state water resource or an outstanding national resource water. Classification as a Tier II wetland would require the presence of a wetland-dependent, threatened or endangered species on a proposed fill site or a proposal to place fill within proximity (one-half mile radius) of the habitat of such "listed" species. Tier I wetlands would include all other wetlands. Fills in either wetland type affecting more than one tenth of an acre (0.10) would require compensatory mitigation (IDEM 1999). Under these new standards compensatory mitigation would also be required for impacts of 0.10 acre or less on Tier I wetlands where it is determined that there will be a significant impact on water quality. Compensatory mitigation on Tier II wetlands would require the applicant to create or restore a wetland, PRIOR to the fill, and

demonstrate that the site would replace the existing and designated uses expected to be impacted on the Tier II site (IDEM 1999). Such an approach also permits the time to characterize a wetland before it is filled, so the success of its replacement can be evaluated.

Such steps would represent an improvement in the process, but little is mentioned of rigorous outcome evaluation and success criteria. Instead the draft standards focus on identifying the type of wetland proposed for fill and the appropriate ratio of mitigation, and clarification of the series of steps in the process. The proposed policies and procedures do mention the replacement of the "existing and designated uses" (which could be interpreted to refer to wetland functions) lost at the impacted wetland as one of their success criteria and they do include monitoring standards. However, the draft does not clarify who decides when to stop monitoring and how the replacement of the "existing and designated uses" will be evaluated. IDEM officials explain that such decisions will be made by the project managers at their discretion. Hence they could still be pressured to allow a fill to proceed even though its replacement wetland is not performing desired functions.

From this study it appears that IDEM looks at the monitoring reports (which are usually produced by a consultant and rarely include negative information about a site), may visit the site and then either release the site early or require continued monitoring. Follow up on these monitoring reports usually includes a simple letter to the consultant saying that they reviewed the report and concur with the results. Most sites continue monitoring for the maximum 5 years, but even if sites are not progressing, IDEM rarely requires remediation. In addition, IDEM now has a mitigation coordinator who has

organized the department's database of mitigation sites and has completed some compensatory mitigation analysis, but this study was not used to determine when to end monitoring or whether or not a site was a success or a failure, just whether a site was constructed or not (Robb 2000). If lack of inspections continues to be the norm, it is likely that mitigation sites will continue to fail without corrective measures being required.

The USACE has recently generated new Nationwide Permits (NWPs), which appear to further regulate wetland impacts. In March, 2000 the Corps announced the issuance of 5 new NWPs and the modification of 6 existing NWPs to replace NWP 26. Under most of these new NWPs, the maximum acreage limit is ½ acre. Under the old NWP 26, impacts were permitted up to an acre, without mitigation, thus a significant new threshold has been established. In addition, the new NWPs set specific conditions and criteria for certain activities. The new NWPs are listed below:

- 3. Maintenance
- 7. Outfall Structures and Maintenance
- 12. Utility Line Activities
- 14. Linear Transportation Crossings
- 27. Stream and Wetland Restoration Activities
- 39. Residential, Commercial, and Institutional Developments
- 40. Agricultural Activities
- 41. Reshaping Existing Drainage Ditches
- 42. Recreational Facilties

Under these new NWPs mitigation is now required for impacts over ½ acre, as relating to the specific activities above. This reduces the loophole that existed under NWP 26, but wetland losses can still occur if the overall impact is ½ acre or less without compensation for losses. Therefore a net loss of wetlands may still occur under these new NWPs.

It is important to note here that both of these recent actions (by IDEM and the USACE) is in wetland regulatory policy. The real test of these new laws, and proposed standards, is their legal enforceability and ecological effectiveness. If these agencies continue to be understaffed and inadequately funded, new policies will not be properly enforced. Even the director of IDEM's water quality certification program (Dennis Clark) agrees that the regulations "look good on paper, but our enforcement needs improvement".

Conclusions

In conclusion, I found that the WIRAM assessments were informative and useful overall, but I also encountered challenges and difficulties in using/applying the method. These included difficulty in answering questions concerning flood/stormwater attenuation, groundwater recharge/discharge, and wildlife habitat. In addition, more time and research was necessary (than prescribed in the method) to accurately depict the wetlands and answer some of the questions on the checklist. Also, due to extensive use of best professional judgment, outcomes from the assessments are likely to vary depending on who is completing the evaluations.

Positive features of the method include its potential for use with both pre-impacted wetlands and resulting compensatory mitigation sites (for comparative studies), its relatively quick application (10-15 hours), and the evaluation of a wide range of wetland functional areas (floral diversity, wildlife habitat, fishery habitat, flood/stormwater attenuation, water quality protection, shoreline protection, groundwater recharge/discharge and aesthetics/recreation/education) which produce multidisciplinary

analysis of wetland mitigation sites, enabling useful characterizations of the relative health/function of sites.

In regards to the case studies, assessments revealed similarities of success with sites and identified areas in which the projects failed to meet their proposed objectives. Similarities of success with the Bear Slide and Little Cicero Creek sites included their location, (near the bottom of steep slopes and in floodplains adjacent to creeks), age (both sites were between 8-9 year olds), and type of mitigation (on-site restoration projects located next to established natural wetlands). In addition, these results tend to support the view that restoration type projects are more beneficial (have better chance of success) than created wetlands (Pebble Brook and Greenwood sites were creation projects and did poorly on the WIRAM).

None of the sites have developed into the type of wetland communities that were proposed in the mitigation objectives. Although the Bear Slide and Little Cicero Creek sites have developed into quality functioning wetlands, they still haven't met their objectives.

From this study, the USACE and IDEM regulatory programs appear to possess well-written, ecologically based, regulations, but inadequate enforcement hinders their effectiveness in protecting wetland resources. Both agencies have spent a great deal of time and resources (in the past year) to develop additional, stricter regulations, which could lead to better protection of wetlands and improved outcomes from compensatory mitigation; however, little guidance is provided for determining mitigation success, monitoring standards, and when remediation is required. Characterizing wetlands and

evaluating whether they are now self-sustaining requires a longer time than the agencies have been able to devote to these tasks (due to political pressure and limited funds).

Recommendations

The WIRAM could be improved by developing a user guidance manual and addressing the ambiguity within some of the problem areas previously mentioned. Detailed guidance for the completion of each section would improve the use of the method and likely lead to more consistent results. Specifically, better guidance information is needed for completion of the flood/stormwater attenuation and groundwater recharge/discharge sections. These sections are very difficult to assess without relevant data and expertise. Finally, multiple field investigations undertaken in critical seasons should be suggested for high priority wetlands. Although this will increase the time necessary to complete the assessments, such information is vital to an ecologically meaningful evaluation of wetland functions. Such improvements in WIRAM will lead to better case studies in the future.

Some specific recommendations for IDEM and the USACE include the development of assessment criteria (specifically for Indiana) for evaluating mitigation success using a functional assessment methodology (like WIRAM or MNRAM). The wetlands to be replaced must be assessed to allow meaningful comparison with the replacement wetlands. Critera could include the evaluation of vegetation, hydrology and soils on the site and assessment of wetland functions such as flood conveyance, flood storage, erosion and sediment control, pollution prevention and control, fish and shellfish production, habitat for waterfowl and other wildlife (including rare and endangered species). Such a method would require agency staff to go into the field and conduct these assessments on

each site every year. If the assessments detect problems on a site, the USACE and IDEM must require consultants to go back to the site to complete additional work (reseeding, replanting, regrading, etc.). Regardless, all sites should be required to have the full five years of monitoring, and if after five years a site still is not progressing, additional remediation and monitoring should be required. After the first 5 years, assessments might be performed every 5 years until the wetland is found to be self-sustaining and of an acceptable type.

Finally, several broader steps should be taken if wetland mitigation and wetland regulation are to fully protect wetland resources and result in a real no net loss of wetlands in America:

- One unified set of minimum federal wetlands conservation regulations. States and Local governments can choose to be more protective. Better coordination between state and federal programs. Proposed projects often require authorizations by several agencies. Coordinating permit decisions may reduce processing time, improve the knowledge of cumulative impacts, and enable the use of Regional General Permits to reduce duplication of applications and combine 401 and 404 conditions.

- Increased staffing and funding for agencies to meaningfully characterize lost and replacement wetlands and to adequately enforce regulations and make permit decisions. Present staffing and funding is inadequate for regulators to make thorough wetland inspections and permit decisions.

- A real "no net loss" wetlands policy. Mitigation requirements for all impacts, not just for dredge and fill activities and for water quality impacts.

- More use of "up front" mitigation and "mitigation banking". Up front mitigation would require an applicant to first restore, create or enhance a wetland of an appropriate size (depending on ratio and type). Then demonstrate that the wetland is a similar type of system and is performing similar functions as the wetland proposed for fill. Mitigation banking involves the creation, restoration or enhancement of larger tracts of wetlands. These banks then receive a certain number of credits, which can be purchased for compensatory mitigation of a similar type within the same watershed (ie, same 8 digit USGS hydrologic unit). Before the bank can be used for mitigation, it must be demonstrated that the system is performing wetland functions and is self-sustaining.

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Appendix A

Bear Slide Golf Course

Wisconsin Department of Natural Resources
RAPID ASSESSMENT METHODOLOGY FOR EVALUATING
WETLAND FUNCTIONAL VALUES

GENERAL INFORMATION
Name of Wetland/Owner: Bear Slide Golf Course
Location. County: Hamilton, Noblesville Quadrangle, Section: 2 & 3
Township: T 19N, Range: R 4E
Project Name: Evaluator(s): Bear Slide Golf Course/Mike Hasty
Date(s) of Site Visit(s): July 1999, October 16, 1999, May 7, 2000

Description of seasonality limitations of the inspection(s) due to time of year of the evaluation(s) and/or current hydrologic and climatologic conditions (e.g. after heavy rains snow or ice cover, during drought year, during spring flood, during bird migration):
-During drought year.

WETLAND DESCRIPTION
Wisconsin Wetland Inventory Classification:
Wetland Type (of mitigation wetland):

-shallow open water
-wet meadow
-shallow marsh
-low prairie
-seasonally flooded basin
-hardwood swamp
-floodplain forest
-deep marsh
-shrub-carr
-bog
-alder thicket
-**emergent sedge meadow (type found on site)**
-coniferous forest
-fen

Estimated size of wetland in acres: 1.5 Size of wetland lost in acres: 0.9 Ratio: 1.6/1

SUMMARY OF FUNCTIONAL VALUES
Based on the results of the attached functional assessment, rate the significance of each of the functional values for the subject wetland and check the appropriate box. Complete the table as the summary.

	SIGNIFICANCE:				
FUNCTION:	Low	Medium	High	Exceptional	n/a
Floral Diversity:				X	
Wildlife Habitat:			X		
Fishery Habitat:		X			
Flood/Stormwater Attenuation:			X		
Water Quality Protection:			X		
Shoreline Protection:					X
Groundwater:		X			
Aesthetics/Recreation/Education:		X			

Table 2

List any Special Features/ "Red Flags"

SITE DESCRIPTION

I. HYDROLOGIC SETTING

A. Describe the geomorphology of the wetland:

_X_ Depressional (includes slopes, potholes, small lakes, kettles, etc.)
___ Riverine
___ Lake Fringe
___ Extensive Peatland

B. Y _X_ , N ___ -Has the wetland hydrology been altered by ditching, tiles, dams, culverts, well pumping, diversion of surface flow, or change to runoff within the watershed (underline those that apply)?

C. Y _X_ , N ____ -Does the wetland have an inlet, outlet, or both (underline those that apply)?

D. Y _X_ , N ____ -Is there any field evidence of wetland hydrology such as buttressed tree trunks, adventitious roots, drift lines, water marks, water stained leaves, soil mottling gleying, organic soils layer, or oxidized rhizopheres (underline those that apply)?

E. Y _X_ , N ____ -Does the wetland have standing water, and if so what is the average depth in inches? _1"_ Approximately how much of the wetland is inundated? _35_ %

F. How is the hydroperiod (seasonal water level pattern) of the wetland classified?

___ Permanently Flooded
___ Seasonally Flooded (water absent at end of growing season)
_X_ Saturated (surface water seldom present)
___ Artificially Flooded
___ Artificially Drained

G. Y _X_ , N ____ -Is the wetland a navigable body of water or is a portion of the wetland below the ordinary highwater mark of a navigable water body? List any surface waters associated with the wetland or in proximity to the wetland (note approximate distance from the wetland and navigability determination). Note if there is a surface water connection to other wetlands.
-Bear Slide Creek, within 100 feet of site.

II. VEGETATION

A. Identify the vegetation communities present and the dominant species (all are native species unless otherwise noted).

-floating leaved community dominated by:
-submerged aquatic community dominated by:
-**emergent community dominated by**: Rice Cutgrass *(Leersia oryoides)* OBL
-shrub community dominated by:
-deciduous broad-leaved tree community dominated by:
-coniferous tree community dominated by:
-open sphagnum mat or bog
-sedge meadow/wet prairie community dominated by:
-other (explain):

B. Other plant species identified during site visit:
Refer to Table 1 on Page 41 for plant classification system.

-Dark Green Bulrush *(Scripus atrovirens)* OBL
-Giant Manna Grass *(Glyceria grandis)* OBL
-Cattail *(Typha angustifolia)* OBL
-Wool Grass *(Scirpus cyperinus)* OBL
-Boneset *(Eupatorium perfoliatum)* FACW
-Fragrant Goldenrod *(Solidago graminifolia)* FACW-
-Willow *(Salix exigua)* OBL
-Sedges *(Carex sp.)* OBL – FAC

III. SOILS

A. SCS Soil Map Classification:
Miami Silt Loam & Shoals Silt Loam

B. Field Description:

___ Organic (histosol) ? If so, is it a muck or a peat?

X Mineral soil?

- Mottling, gleying, sulfidic materials, iron or manganese concretions, organic streaking (underline those that apply)?
- Soil Description:
  Miami series – Deep, well drained soils on till plains.
  Shoals series – Deep, somewhat poorly drained, moderately permeable soils on flood plains.
- Depth of mottling/gleying: *Soil survey mentions mottles to C4 –52 to 56 inches.*
- Depth of A Horizon: *11 inches.*
- Munsell Color of the matrix and mottles
  -Matrix below the A horizon (10" depth): *5Y 3/1 & 3/2*
  -Mottles: *2.5Y 2/0, 5YR 4/4 & 7.5YR 4/6*

V. SURROUNDING LAND USES

A. What is the estimated area of the wetland watershed in acres? 20-30

B. What are the surrounding land uses?
-Golf course..

LAND-USE	ESTIMATED % OF WETLAND WATERSHED
Developed: (Industrial/Commercial/Residential)	5
Agricultural/cropland:	5
Agricultural/grazing:	5
Forested:	50
Grassed recreation areas/parks:	30
Old field:	0
Highways or roads:	5
Other (specify):	

Table 3

VI. SITE SKETCH

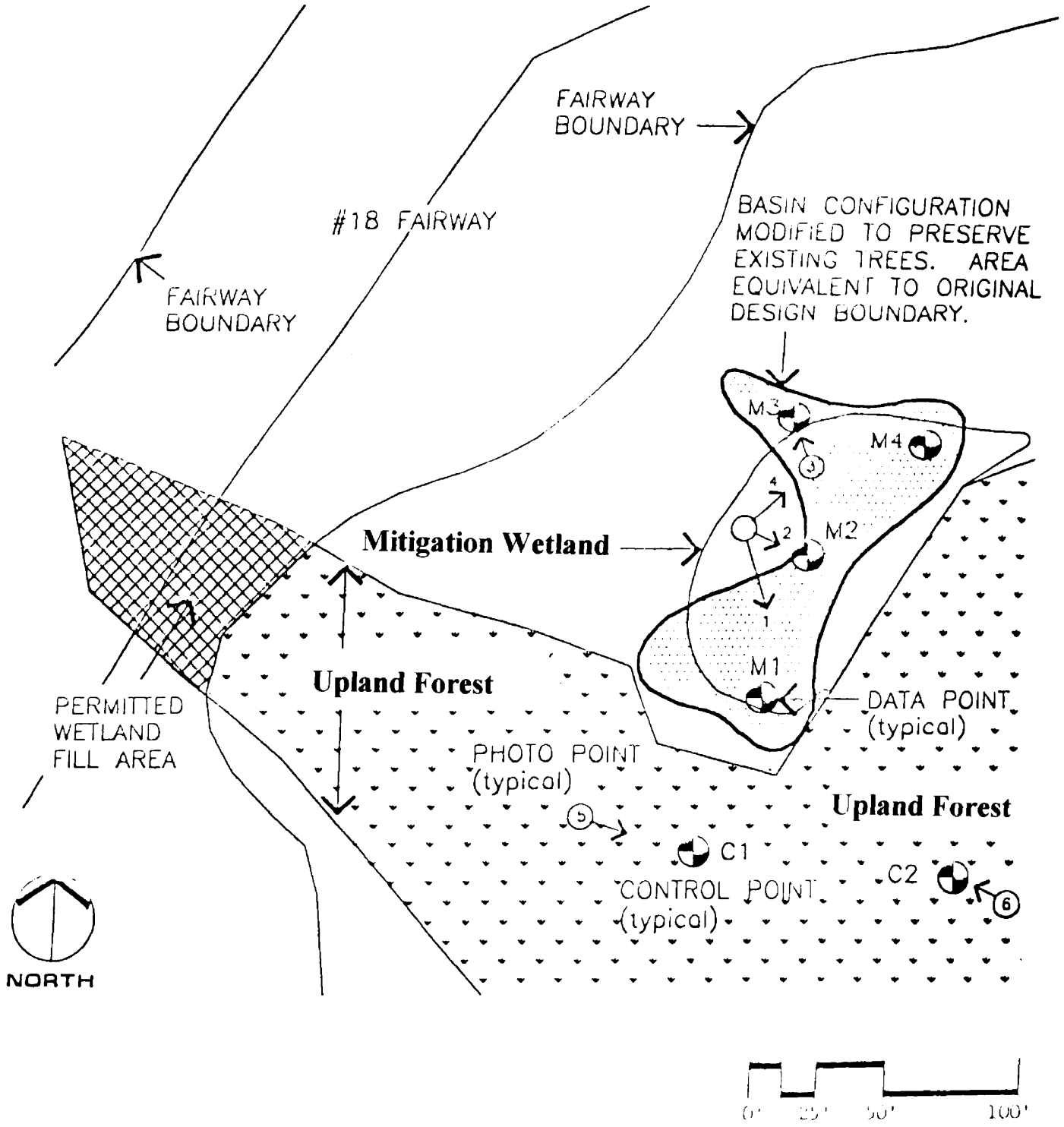


Figure 3

The following assessment requires the evaluator to examine site conditions that provide evidence that a given functional value is present and to assess the significance of the wetland to perform those functions. Positive answers to the questions are not definitive and are only provided to guide the evaluation. After completing each section, the evaluator should consider the factors observed and use best professional judgment to rate the significance. The ratings should be recorded on page 1 of the assessment.

Special Features/ RED FLAGS

1. Y ___ , N **X** -Is the wetland in or adjacent to an area of special natural resource interest? If so, check those that apply:

	a. Cold water community as defined in state code. (including trout streams, their tributaries, and trout lakes);
	b. Lakes Michigan and Superior and the Mississippi River;
	c. State or federal designated wild and scenic river;
	d. Designated state riverway;
	e. Designated state scenic urban waterway;
	f. Environmentally sensitive area or environmental corridor identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
	g. Calcereous fen;
	h. State park, forest, trail or recreation area;
	i. State and federal fish and wildlife refuges and fish and wildlife management areas;
	j. State and federal designated wilderness area;
	k. Designated or dedicated state natural area;
	l. Wild rice water listed in state code;
	m. Surface water identified as an outstanding or exceptional use water in state code.

Table 4

2. Y ____ , N **X** -According to the Natural Heritage Inventory (Bureau of Endangered Resources) or direct observations, are there any rare, endangered, or threatened plant or animal species in, near, or using the wetland or adjacent lands? If so, list the species of concern:

3. Y ____ , N **X** -Is the project located in an area that requires a State Coastal Zone Management Plan consistency determination?

Floral Diversity

1. Y _X_ , N ____ -Does the wetland support a variety of native species (i.e. not a monotypic stand of cattail or giant reed grass and/or not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc.) ?

2. Y ___ , N _X_ -Is the wetland plant community regionally scarce or rare?

Wildlife and Fishery Habitat

1. List any species observed, evidenced (e.g. tracks, scat, nest/burrow, calls), or expected to utilize the wetland:
   -Red-winged Blackbirds, deer, raccoons, squirrels, ground hog and opossum.

2. Y _X_ , N ____ -Does the wetland contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types? – Possesses a scrub/shrub layer (willows).

3. Y ____ , N _X_ -Is the estimated ratio of open water to cover between 30 and 70 percent? What is the estimated ratio? __10__%

4. Y _X_ , N ____ -Does the surrounding upland habitat likely support a variety of animal species? – Beyond the golf course lies a large upland forest.

5. Y ____ , N _X_ -Is the wetland part of or associated with a wildlife corridor or designated wildlife corridor?

6. Y ____ , N _X_ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land important for wildlife that require large home ranges (e.g. bear, woodland passerines)?

7. Y _X_ , N ____ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land within an urbanized environment that is important for wildlife?

8. Y _X_ , N ____ -Are there other wetland areas near the subject wetland that may be important to wildlife?

9. Y ____ , N _X_ -Is the wetland contiguous with a permanent waterbody or periodically inundated for sufficient periods of time to provide spawning/nursery habitat for fish?

10. Y _X_ , N ____ -Can the wetland provide significant food base for fish and wildlife (e.g. insects, crustaceans, voles, forage fish, amphibians, reptiles, shrews, wild rice, wild celery, duckweed, pondweeds, watermeal, bulrushes, bur reeds, arrowhead, smartweeds, millets...)?

11. Y ____ , N _X_ -Is the wetland located in a priority watershed/township as identified in the Upper Mississippi and Great Lakes Joint Venture of the North American Waterfowl Management Plan?

12. Y _X_ , N ____ -Is the wetland providing habitat that is scarce to the region?

Flood and Stormwater Storage/Attenuation

1. Y _X_ , N ____ -Are there steep slopes, large impervious areas, moderate slopes with row cropping, or areas with severe overgrazing within the watershed (underline those that apply)?

2. Y _X_ , N ____ -Does the wetland significantly reduce run-off velocity due to its size, configuration, braided flow patterns, or vegetation type density? – It is designed to catch run-off from the surrounding upland areas.

3. Y ____ , N _X_ -Does the wetland show evidence of flashy water level responses to storm events (debris marks, erosion lines, stormwater inputs, channelized inflow)?

4. Y ____ , N _X_ -Is there a natural feature or human-made structure impeding drainage from the wetland that causes backwater conditions?

5. Y _X_ , N ____ -Considering the size of the wetland area in relation to the size of its watershed, at any time during the year is water likely to reach the wetland's storage capacity (i.e. the level of easily observable wetland vegetation)? [For some cases where greater documentation is required, one should determine if the wetland has capacity to hold 25% of the run-off from a 2 year-24 hour storm event.]

6. Y _X_ , N ____ -Considering the location of the wetland in relation to the associated surface water watershed, is the wetland important for attenuating or storing flood or stormwater peaks (i.e. is the wetland located in the mid or lower reaches of the watershed)?

Water Quality Protection

1. Y _X_ , N ____ - Does the wetland receive overland flow or direct discharge of stormwater as a primary source of water (underline that which applies)?

2. Y _X_ , N ____ -Do the surrounding land uses have the potential to deliver significant nutrient and/or sediment loads to the wetland?

3. Y _X_ , N ____ -Based on your answers to the flood/stormwater section above, does the wetland perform significant flood/stormwater attenuation (residence time to allow settling)?

4. Y _X_ , N ____ -Does the wetland have sufficient vegetative density to decrease water energy and allow settling of suspended materials? – Actual density required to settle particles is unknown for this site. The determination was arrived upon using Best Professional Judgement.

5. Y _X_ , N ____ -Is the position of the wetland in the landscape such that run-off is held or filtered before entering a surface water?

6. Y ____ , N _X_ -Are algal blooms, heavy macrophyte growth, or other signs of excess nutrient loading to the wetland apparent (or historically reported)?

Shoreline Protection

1. Y ____ , N _X_ -Is the wetland in a lake fringe or riverine setting? If NO, STOP And enter "not applicable" for this section. If YES, then answer the applicable questions.

2. N/A _X_ -Is the shoreline exposed to constant wave action caused by a long wind fetch or boat traffic?

3. N/A _X_ -Is the shoreline and shallow littoral zone vegetated with submerged or emergent vegetation in the swash zone that decrease wave energy or perennial wetland species that form dense root mats and/or species that have strong stems that are resistant to erosive forces?

4. N/A _X_ -Is the stream bank prone to erosion due to unstable soils, land uses, or ice floes?

5. N/A _X_ -Is the stream bank vegetated with densely rooted shrubs that provide upper bank stability?

Groundwater Recharge and Discharge

1. Y ____ , N _X_ -Related to discharge, are there observable (or reported) springs located in the wetland, physical indicators of springs such as marl soil, or vegetation indicators such as watercress or marsh marigold present that tend to indicate the presence of groundwater springs?

2. Y _X_ , N ___ -Related to discharge, may the wetland contribute to the maintenance of base flow in a stream?

3. Y _X_ , N ___ -Related to recharge, is the wetland located on or near a groundwater divide (e.g. a topographic high)?

Aesthetics/Recreation/Education and Science

1. Y _X_ , N ___ -Is the wetland visible from any of the following kinds of points: roads, public land, houses, and/or businesses? (Underline all that apply.)

2. Y _X_ , N ___ -Is the wetland in or near any population centers?

3. Y ____ , N _X_ -Is any part of the wetland in public or conservation ownership?

4. Y ____ , N _X_ -Does the public have direct access to the wetland from public roads or waterways? (Underline those that apply.)

Aesthetics/Recreation/Education and Science (continued)

5. Is the wetland itself relatively free of obvious human influences, such as:

   a. Y __X__ , N ____ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?
   d. Y __X__ , N ____ -Trash?
   e. Y __X__ , N ____ -Pollution?
   f. Y __X__ , N ____ -Filling?
   g. Y __X__ , N ____ -Dredging/draining?
   h. Y __X__ , N ____ -Domination by non-native vegetation?

6. Is the surrounding viewshed relatively free of obvious human influences, such as:

   a. Y ___ , N __X__ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?

7. Y ____ , N __X__ -Is the wetland organized into a variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water)?

8. Y __X__ , N ____ -Does the wetland add to the variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water) within the landscape as a whole?

9. Y __X__ , N ____ -Does the wetland encourage exploration because any of the following factors are present:

   a. Y ____ , N __X__ -Long views within the wetland?
   b. Y ____ , N __X__ -Long views in the viewshed adjacent to the wetland?
   c. Y __X__ , N ___ -Convoluted edges within and/or around the wetland border?

10. Y __X__ , N ___ -Is the wetland currently being used for (or does it have the potential to be used for) the following recreational activities? (Check all that apply.)

ACTIVITY:	CURRENT USE:	POTENTIAL USE:
Nature study/photography:		X
Hiking/biking/skiing:		
Hunting/fishing/trapping:		
Boating/canoeing:		
Food harvesting:		
Others (list):		

Table 5

11. Y __X__ , N ___ -Is the wetland currently being used, and/or does it have the potential for use for educational or scientific study purposes (underline those that apply)? *-Not currently being used, but certainly does possesses excellent wetland characteristics for potential educational audiences.*

Bear Slide Creek Site
Noblesville Quadrangle

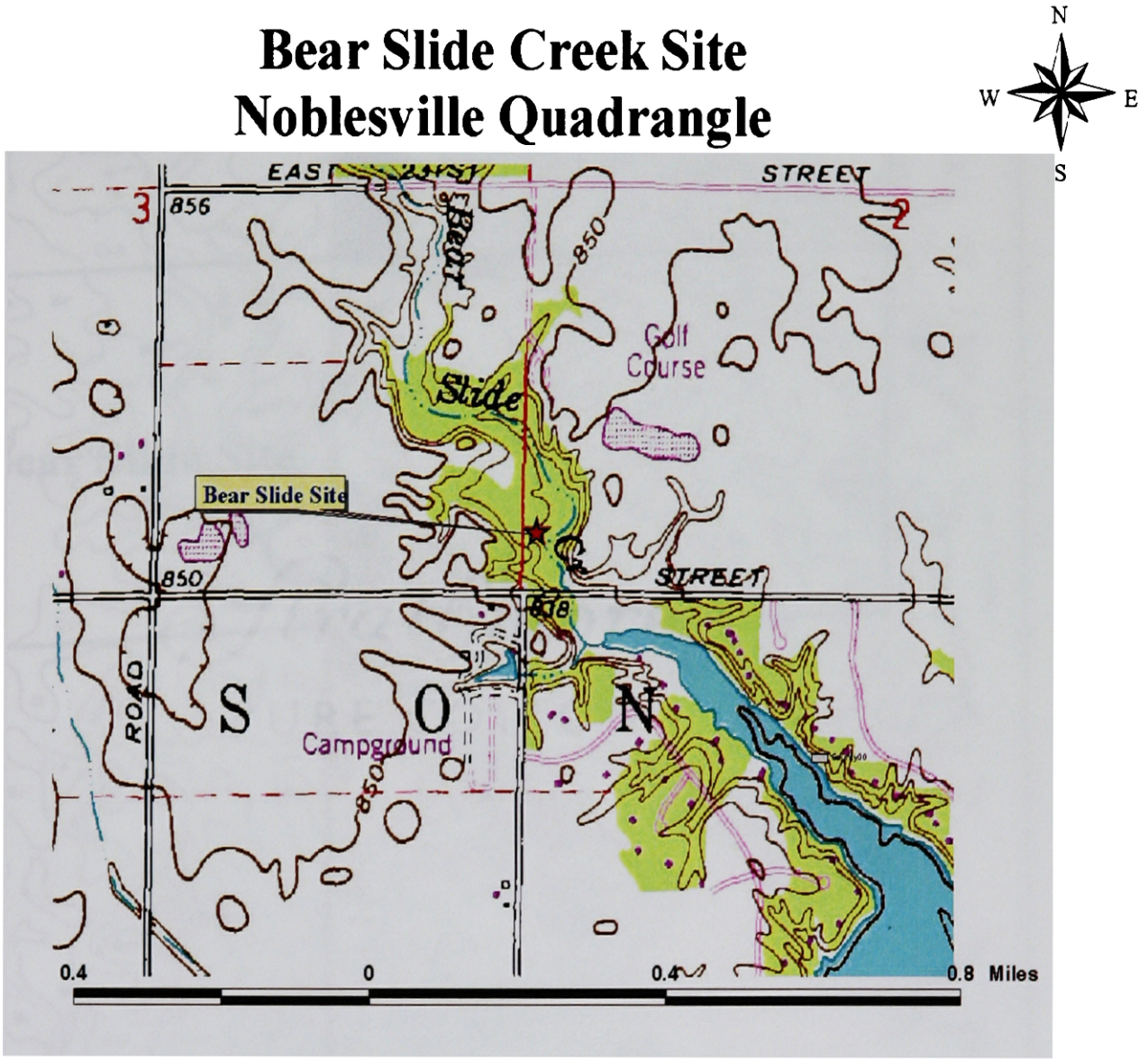


Figure 4

Location Map of Bear Slide Golf Course Site

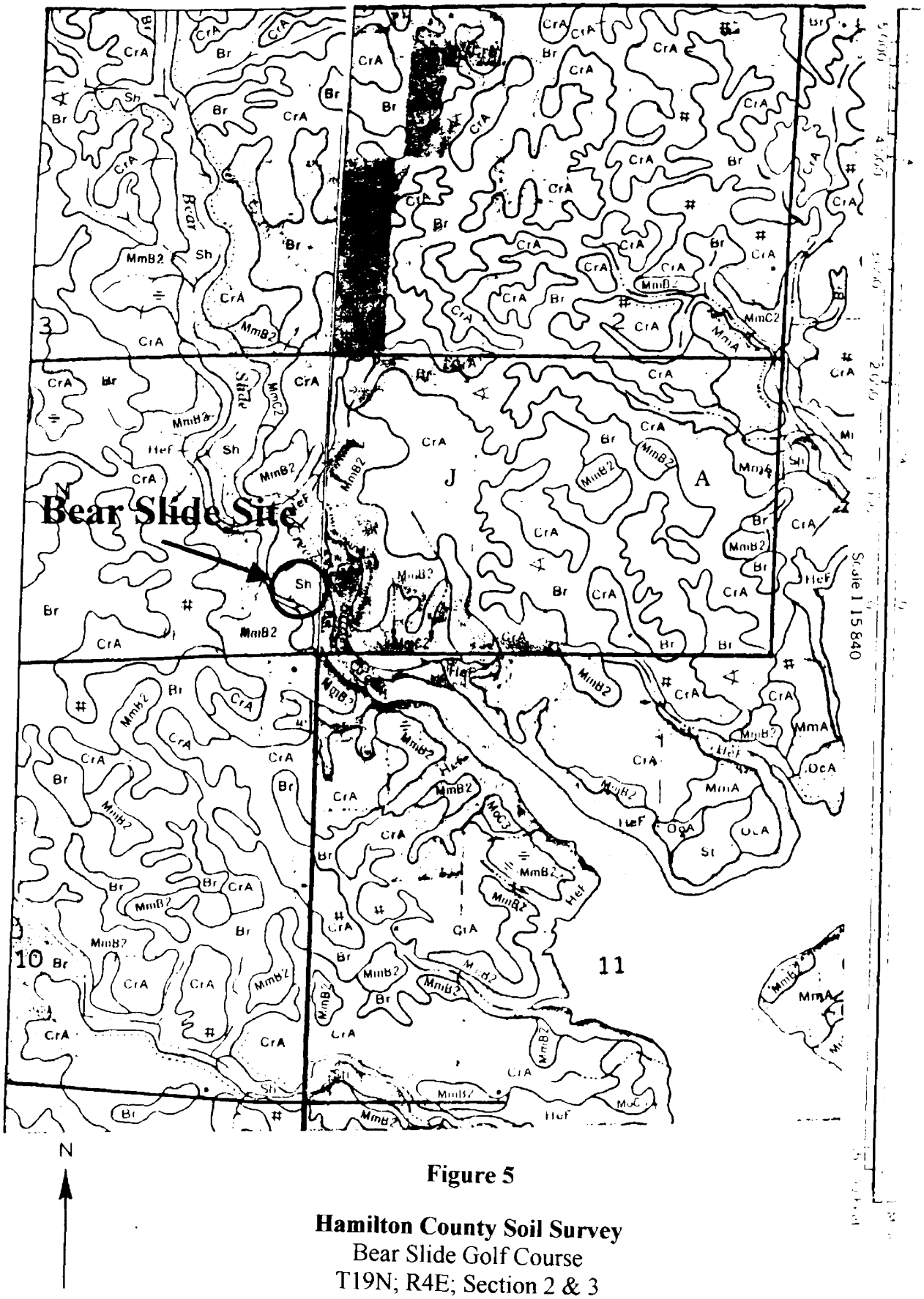


Figure 5

Hamilton County Soil Survey
Bear Slide Golf Course
T19N; R4E; Section 2 & 3
Noblesville Quadrangle

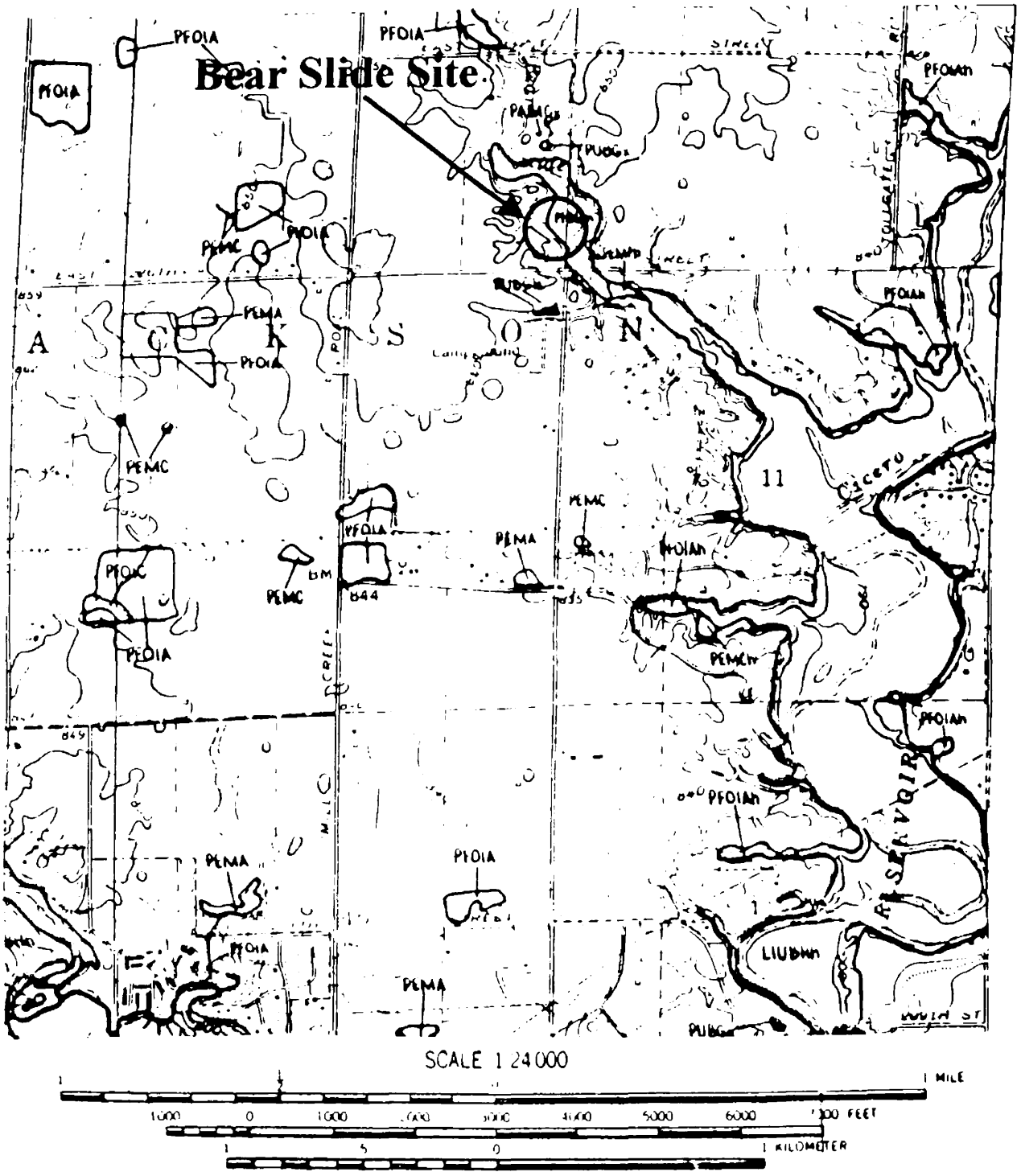


Figure 6

National Wetland Inventory
Bear Slide Golf Course
T19N; R4E; Section 2 & 3
Noblesville Quadrangle

Pebble Brook Golf Course

Wisconsin Department of Natural Resources

RAPID ASSESSMENT METHODOLOGY FOR EVALUATING
WETLAND FUNCTIONAL VALUES

GENERAL INFORMATION
Name of Wetland/Owner: Pebble Brook Golf Course
Location. County: Hamilton, Noblesville Quadrangle, Section: 28 & 33
Township: T 19N, Range: R 4E
Project Name: Evaluator(s): Pebble Brook Golf Course/Mike Hasty
Date(s) of Site Visit(s): May 5, 1999, August 19, 1999, October 16, 1999 and May 7, 2000

Description of seasonality limitations of the inspection(s) due to time of year of the evaluation(s) and/or current hydrologic and climatologic conditions (e.g. after heavy rains snow or ice cover, during drought year, during spring flood, during bird migration):
-During drought year.

WETLAND DESCRIPTION
Wisconsin Wetland Inventory Classification:
Wetland Type (of mitigation wetland):

-shallow open water
-wet meadow (type identified on site)
-deep marsh
-shrub-carr
-shallow marsh
-low prairie
-seasonally flooded basin
-hardwood swamp
-floodplain forest
-bog
-alder thicket
-emergent sedge meadow (permitted type/proposed)
-coniferous forest
-fen

Estimated size of wetland in acres: 1.3 Size of wetland lost in acres: 0.89 Ratio: 1.4/1

SUMMARY OF FUNCTIONAL VALUES
Based on the results of the attached functional assessment, rate the significance of each of the functional values for the subject wetland and check the appropriate box. Complete the table as the summary.

	SIGNIFICANCE:				
FUNCTION:	Low	Medium	High	Exceptional	n/a
Floral Diversity:		X			
Wildlife Habitat:	X				
Fishery Habitat:	X				
Flood/Stormwater Attenuation:		X			
Water Quality Protection:		X			
Shoreline Protection:					X
Groundwater:		X			
Aesthetics/Recreation/Education:		X			

Table 6

List any Special Features/ "Red Flags":

SITE DESCRIPTION

I. HYDROLOGIC SETTING

A. Describe the geomorphology of the wetland:

_X_ Depressional (includes slopes, potholes, small lakes, kettles, etc.)
___ Riverine
___ Lake Fringe
___ Extensive Peatland

B. Y_X_ , N ___-Has the wetland hydrology been altered by ditching, tiles, dams, culverts, well pumping, diversion of surface flow, or change to runoff within the watershed (underline those that apply)?

C. Y _X_ , N ____ -Does the wetland have an inlet, outlet, or both (underline those that apply)?

D. Y _X_ , N ____ -Is there any field evidence of wetland hydrology such as buttressed tree trunks, adventitious roots, drift lines, water marks, water stained leaves, soil mottling gleying, organic soils layer, or oxidized rhizopheres (underline those that apply)?

E. Y ___ , N _X_-Does the wetland have standing water, and if so what is the average depth in inches? ___ Approximately how much of the wetland is inundated? ____ %

F. How is the hydroperiod (seasonal water level pattern) of the wetland classified?

___ Permanently Flooded
___ Seasonally Flooded (water absent at end of growing season)
_X_ Saturated (surface water seldom present)
___ Artificially Flooded
___ Artificially Drained

G. Y ___ , N _X_-Is the wetland a navigable body of water or is a portion of the wetland below the ordinary highwater mark of a navigable water body? List any surface waters associated with the wetland or in proximity to the wetland (note approximate distance from the wetland and navigability determination). Note if there is a surface water connection to other wetlands.

II. VEGETATION

A. Identify the vegetation communities present and the dominant species (all are native species unless otherwise noted).

-floating leaved community dominated by:
-submerged aquatic community dominated by:
-**emergent community dominated by**: Creeping Bentgrass *(Agrostis alba palustis)* FACW
-shrub community dominated by:
-deciduous broad-leaved tree community dominated by:
-coniferous tree community dominated by:
-open sphagnum mat or bog
-sedge meadow/wet prairie community dominated by:
-other (explain):

C. Other plant species identified during site visit:
Refer to Table 1 on Page 41 for plant classification system.

-Duckweed *(Lemna sp.)* OBL
-Cattail *(Typha angustifolia)* OBL
-Willow *(Salix exigua)* OBL
-Fragrant Goldenrod *(Solidago graminifolia)* FACW-
-Panic grass *(Panicum sp.)* FACW-FACU
-Cattail *(Typha latifolia)* OBL
-Timothy *(Phleum pratense)* FACU

III. SOILS

A. SCS Soil Map Classification:
Brookstone Silty Clay Loam

B. Field Description:

___ Organic (histosol) ? If so, is it a muck or a peat?

X Mineral soil?

- Mottling, gleying, sulfidic materials, iron or manganese concretions, organic streaking (underline those that apply)?
- Soil Description:
  Brookstone series -Deep, *very poorly drained, moderately permeable soils on glacial till plains.*
- Depth of mottling/gleying: *Soil survey identifies mottles to C – 58 to 70 inches.*
- Depth of A Horizon: *Around 11 inches.*
- Munsell Color of the matrix and mottles
  -Matrix below the A horizon (10" depth): *10YR 5/2*
  -Mottles: *10YR 5/6*

VI. SITE SKETCH

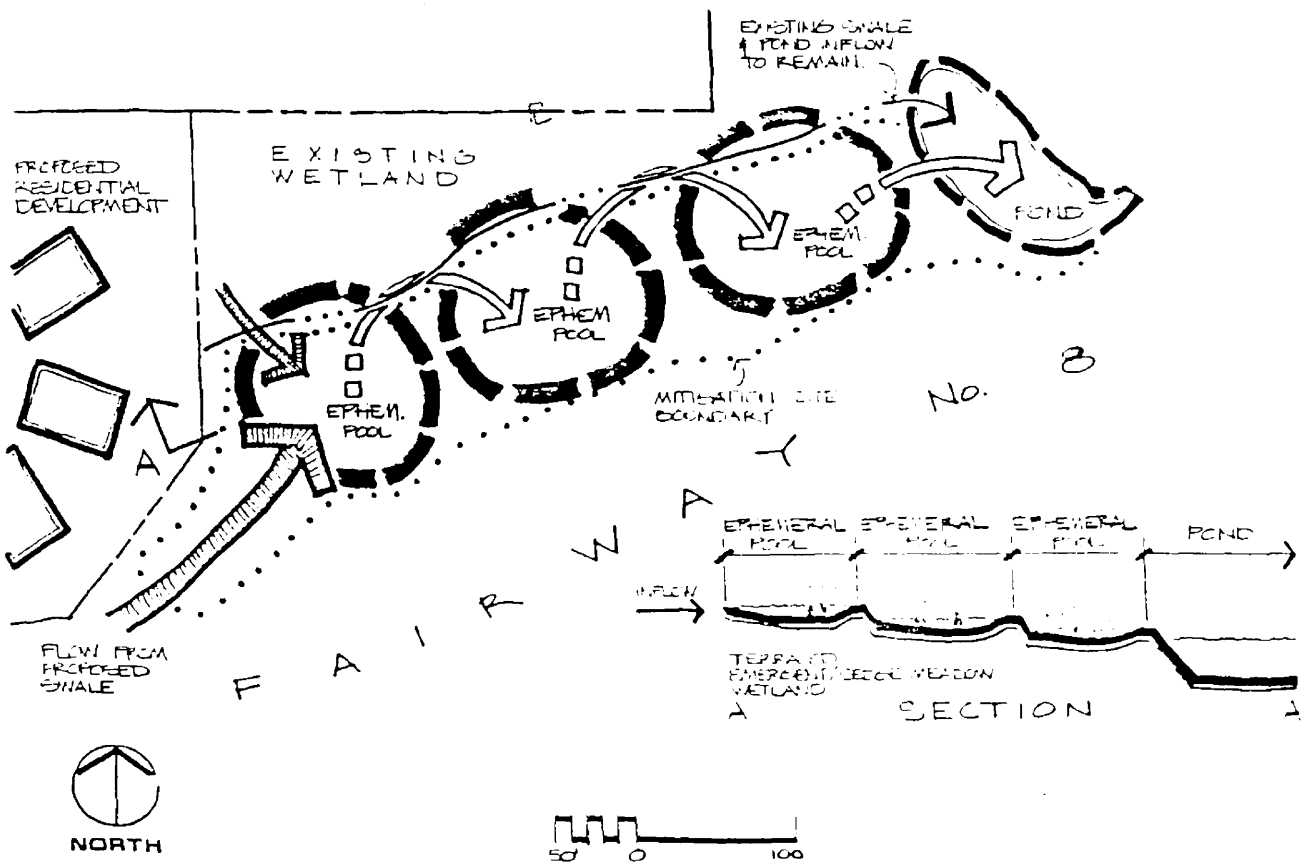


Figure 7
(Of designed wetland)

V. SURROUNDING LAND USES

A. What is the estimated area of the wetland watershed in acres? 10-20

B. What are the surrounding land uses?
-Golf course and residential housing.

LAND-USE	ESTIMATED % OF WETLAND WATERSHED
Developed: (Industrial/Commercial/Residential)	80
Agricultural/cropland:	5
Agricultural/grazing:	0
Forested:	10
Grassed recreation areas/parks:	0
Old field:	0
Highways or roads:	5
Other (specify):	

Table 7

FUNCTIONAL ASSESSMENT

The following assessment requires the evaluator to examine site conditions that provide evidence that a given functional value is present and to assess the significance of the wetland to perform those functions. Positive answers to the questions are not definitive and are only provided to guide the evaluation. After completing each section, the evaluator should consider the factors observed and use best professional judgment to rate the significance. The ratings should be recorded on page 1 of the assessment.

Special Features/ RED FLAGS

2. Y ___ , N **X** -Is the wetland in or adjacent to an area of special natural resource interest? If so, check those that apply:

	a. Cold water community as defined in state code. (including trout streams, their tributaries, and trout lakes);
	b. Lakes Michigan and Superior and the Mississippi River;
	c. State or federal designated wild and scenic river;
	d. Designated state riverway;
	e. Designated state scenic urban waterway;
	f. Environmentally sensitive area or environmental corridor identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
	g. Calcereous fen;
	h. State park, forest, trail or recreation area;
	i. State and federal fish and wildlife refuges and fish and wildlife management areas;
	j. State and federal designated wilderness area;
	k. Designated or dedicated state natural area;
	l. Wild rice water listed in state code;
	m. Surface water identified as an outstanding or exceptional use water in state code.

Table 8

3. Y ____ , N **X** -According to the Natural Heritage Inventory (Bureau of Endangered Resources) or direct observations, are there any rare, endangered, or threatened plant or animal species in, near, or using the wetland or adjacent lands? If so, list the species of concern:

4. Y ____ , N **X** -Is the project located in an area that requires a State Coastal Zone Management Plan consistency determination?

Floral Diversity

1. Y _X_ , N ____ -Does the wetland support a variety of native species (i.e. not a monotypic stand of cattail or giant reed grass and/or not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc.) ?

2. Y ____ , N _X_ -Is the wetland plant community regionally scarce or rare?

Wildlife and Fishery Habitat

1. List any species observed, evidenced (e.g. tracks, scat, nest/burrow, calls), or expected to utilize the wetland:
   -Couldn't identify bird species observed. No mammal tracks were observed.

2. Y ____ , N _X_ -Does the wetland contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types?

3. Y ____ , N _X_ -Is the estimated ratio of open water to cover between 30 and 70 percent? What is the estimated ratio? ____%

4. Y ____ , N _X_ -Does the surrounding upland habitat likely support a variety of animal species?

5. Y ____ , N _X_ -Is the wetland part of or associated with a wildlife corridor or designated wildlife corridor?

6. Y ____ , N _X_ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land important for wildlife that require large home ranges (e.g. bear, woodland passerines)?

7. Y ____ , N _X_ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land within an urbanized environment that is important for wildlife?

8. Y ____ , N _X_ -Are there other wetland areas near the subject wetland that may be important to wildlife?

9. Y ____ , N _X_ -Is the wetland contiguous with a permanent waterbody or periodically inundated for sufficient periods of time to provide spawning/nursery habitat for fish?

10. Y ___ , N _X_ -Can the wetland provide significant food base for fish and wildlife (e.g. insects, crustaceans, voles, forage fish, amphibians, reptiles, shrews, wild rice, wild celery, duckweed, pondweeds, watermeal, bulrushes, bur reeds, arrowhead, smartweeds, millets...)?

11. Y ____ , N _X_ -Is the wetland located in a priority watershed/township as identified in the Upper Mississippi and Great Lakes Joint Venture of the North American Waterfowl Management Plan?

12. Y ____ , N _X_ -Is the wetland providing habitat that is scarce to the region?

Flood and Stormwater Storage/Attenuation

1. Y ____ , N _X_ -Are there steep slopes, large impervious areas, moderate slopes with row cropping, or areas with severe overgrazing within the watershed (underline those that apply)?

2. Y ____ , N _X_ -Does the wetland significantly reduce run-off velocity due to its size, configuration, braided flow patterns, or vegetation type density?

3. Y ____ , N _X_ -Does the wetland show evidence of flashy water level responses to storm events (debris marks, erosion lines, stormwater inputs, channelized inflow)?

4. Y ____ , N _X_ -Is there a natural feature or human-made structure impeding drainage from the wetland that causes backwater conditions?

5. Y _X_ , N ____ -Considering the size of the wetland area in relation to the size of its watershed, at any time during the year is water likely to reach the wetland's storage capacity (i.e. the level of easily observable wetland vegetation)? [For some cases where greater documentation is required, one should determine if the wetland has capacity to hold 25% of the run-off from a 2 year-24 hour storm event.]

6. Y ____ , N _X_ -Considering the location of the wetland in relation to the associated surface water watershed, is the wetland important for attenuating or storing flood or stormwater peaks (i.e. is the wetland located in the mid or lower reaches of the watershed)?

Water Quality Protection

1. Y _X_ , N ____ - Does the wetland receive overland flow or direct discharge of stormwater as a primary source of water (underline that which applies)?

2. Y _X_ , N ____ -Do the surrounding land uses have the potential to deliver significant nutrient and/or sediment loads to the wetland?

3. Y ____ , N _X_ -Based on your answers to the flood/stormwater section above, does the wetland perform significant flood/stormwater attenuation (residence time to allow settling)?

4. Y ____ , N _X_ -Does the wetland have significant vegetative density to decrease water energy and allow settling of suspended materials?

5. Y _X_ , N ____ -Is the position of the wetland in the landscape such that run-off is held or filtered before entering a surface water?

6. Y ____ , N _X_ -Are algal blooms, heavy macrophyte growth, or other signs of excess nutrient loading to the wetland apparent (or historically reported)?

Shoreline Protection

1. Y ____ , N _X_ -Is the wetland in a lake fringe or riverine setting? If NO, STOP And enter "not applicable" for this section. If YES, then answer the applicable questions.

2. N/A _X_ -Is the shoreline exposed to constant wave action caused by a long wind fetch or boat traffic?

3. N/A _X_ -Is the shoreline and shallow littoral zone vegetated with submerged or emergent vegetation in the swash zone that decrease wave energy or perennial wetland species that form dense root mats and/or species that have strong stems that are resistant to erosive forces?

4. N/A _X_ -Is the stream bank prone to erosion due to unstable soils, land uses, or ice floes?

5. N/A _X_ -Is the stream bank vegetated with densely rooted shrubs that provide upper bank stability?

Groundwater Recharge and Discharge

1. Y ____ , N _X_ -Related to discharge, are there observable (or reported) springs located in the wetland, physical indicators of springs such as marl soil, or vegetation indicators such as watercress or marsh marigold present that tend to indicate the presence of groundwater springs?

2. Y ____ , N _X_ -Related to discharge, may the wetland contribute to the maintenance of base flow in a stream?

3. Y ____ , N _X_ -Related to recharge, is the wetland located on or near a groundwater divide (e.g. a topographic high)?

Aesthetics/Recreation/Education and Science

1. Y _X_ , N ____ -Is the wetland visible from any of the following kinds of points: roads, public land, houses, and/or businesses? (Underline all that apply.)

2. Y _X_ , N ____ -Is the wetland in or near any population centers?

3. Y ____ , N _X_ -Is any part of the wetland in public or conservation ownership?

4. Y ____ , N _X_ -Does the public have direct access to the wetland from public roads or waterways? (Underline those that apply.)

Aesthetics/Recreation/Education and Science (continued)

5. Is the wetland itself relatively free of obvious human influences, such as:

   a. Y ____ , N __X__ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?
   d. Y __X__ , N ____ -Trash?
   e. Y __X__ , N ____ -Pollution?
   f. Y __X__ , N ____ -Filling?
   g. Y __X__ , N ____ -Dredging/draining?
   h. Y __X__ , N ____ -Domination by non-native vegetation?

6. Is the surrounding viewshed relatively free of obvious human influences, such as:

   a. Y ____ , N __X__ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?

7. Y ____ , N __X__ -Is the wetland organized into a variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water)?

8. Y __X__ , N ____ -Does the wetland add to the variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water) within the landscape as a whole?

9. Y __X__ , N ___ -Does the wetland encourage exploration because any of the following factors are present:

   a. Y __X__ , N ___ -Long views within the wetland?
   b. Y __X__ , N ___ -Long views in the viewshed adjacent to the wetland?
   c. Y __X__ , N ___ -Convoluted edges within and/or around the wetland border?

10. Y __X__ , N ___ -Is the wetland currently being used for (or does it have the potential to be used for) the following recreational activities? (Check all that apply.)

ACTIVITY:	CURRENT USE:	POTENTIAL USE:
Nature study/photography:		X
Hiking/biking/skiing:		
Hunting/fishing/trapping:		No; Private Property
Boating/canoeing:		
Food harvesting:		
Others (list):		

Table 9

11. Y ____ , N __X__ -Is the wetland currently being used, and/or does it have the potential for use for educational or scientific study purposes (underline those that apply)? – *Not currently being used.*

Pebble Brook Golf Course Site

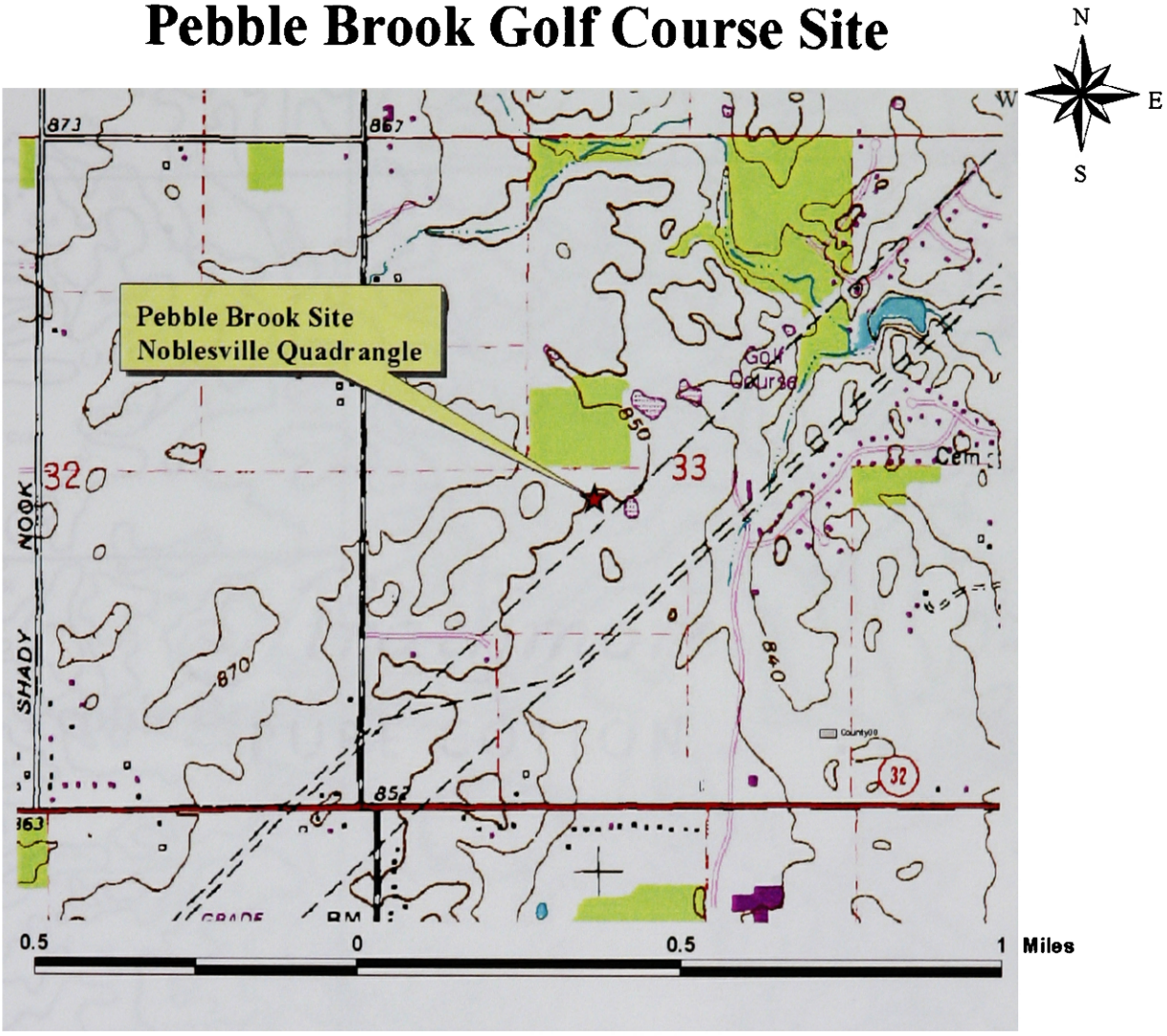


Figure 8

Location Map of Pebble Brook Golf Course Site

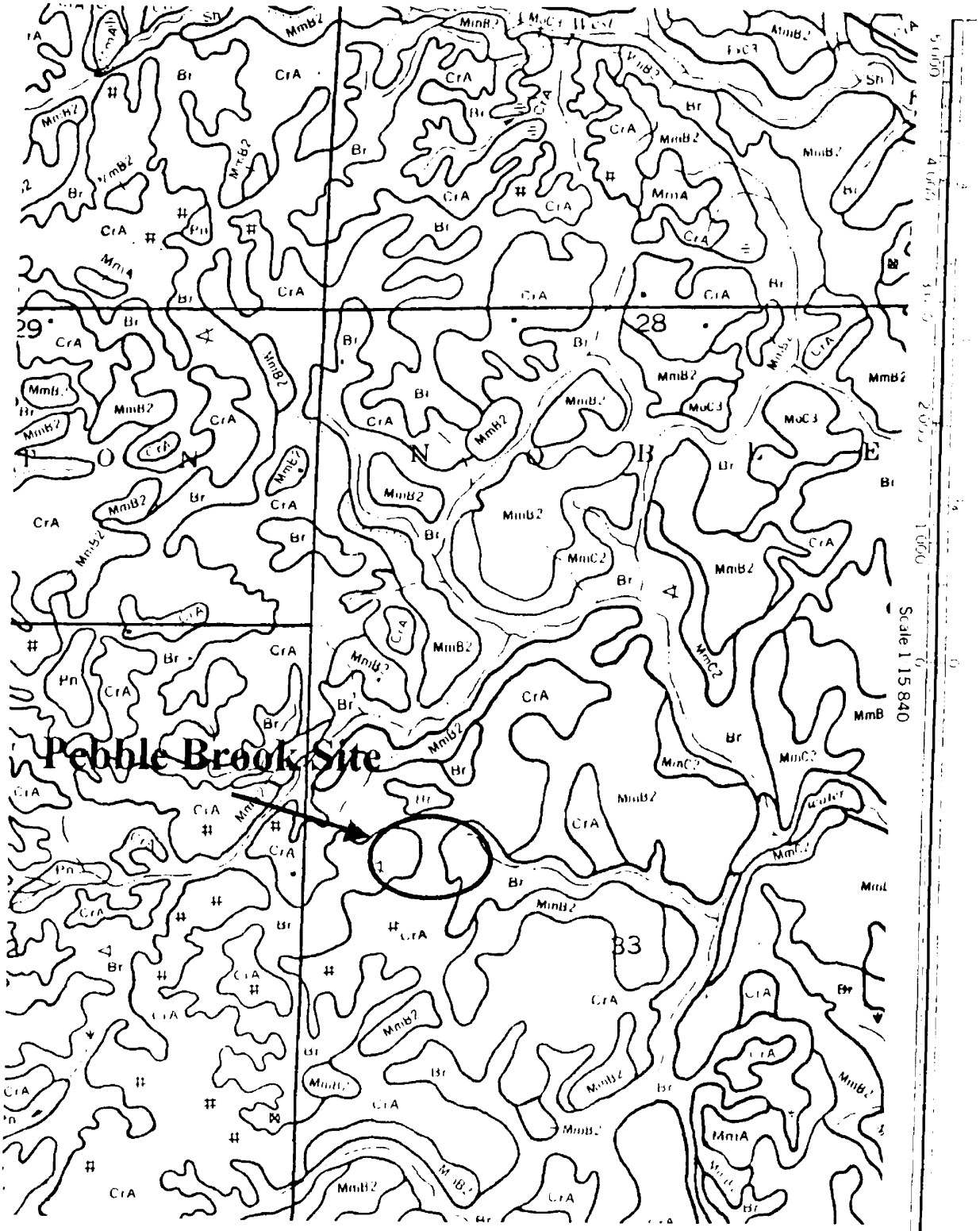


Figure 9

N

Hamilton County Soil Survey
Pebble Brook Golf Course
T19N; R4E; Section 28 & 33
Noblesville Quadrangle

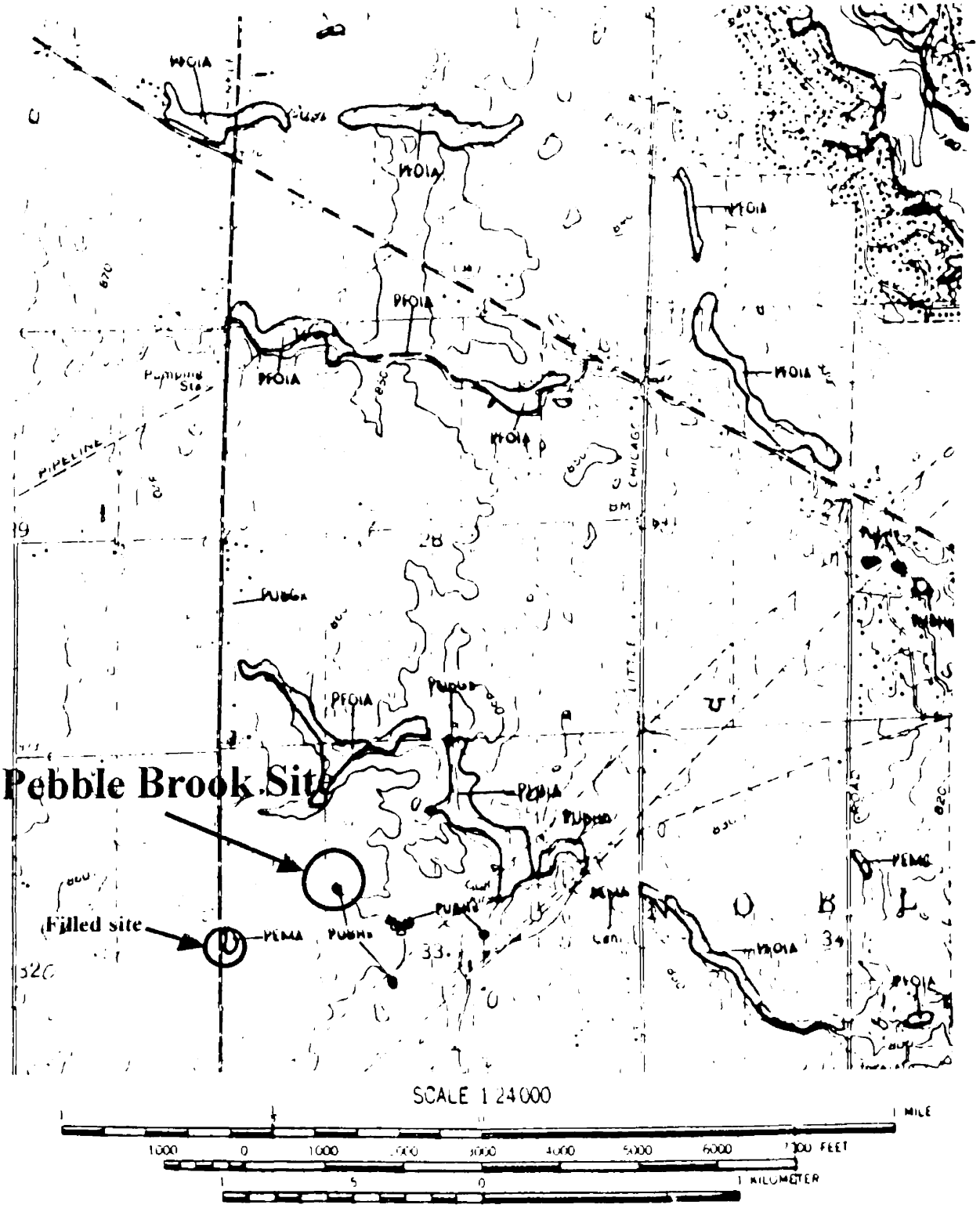


Figure 10

National Wetland Inventory
Pebble Brook Golf Course
T19N; R4E; Section 28 & 33
Noblesville Quadrangle

Little Cicero Creek

Wisconsin Department of Natural Resources

RAPID ASSESSMENT METHODOLOGY FOR EVALUATING
WETLAND FUNCTIONAL VALUES

GENERAL INFORMATION
Name of Wetland/Owner: Little Cicero Creek
Location. County: Hamiliton, Arcadia Quadrangle, Section: 26
Township: T 20N, Range: R 4E
Project Name: Evaluator(s): Little Cicero Creek/Mike Hasty
Date(s) of Site Visit(s): May 1999, June 27, 1999, October 16, 1999, May 8, 2000

Description of seasonality limitations of the inspection(s) due to time of year of the evaluation(s) and/or current hydrologic and climatologic conditions (e.g. after heavy rains snow or ice cover, during drought year, during spring flood, during bird migration):
- *During drought year.*

WETLAND DESCRIPTION
Wisconsin Wetland Inventory Classification:
Wetland Type (of mitigation wetland):

-shallow open water
-wet meadow
-deep marsh
-shrub-carr
-shallow marsh
-low prairie
-**seasonally flooded basin (type identified on site)**
-hardwood swamp
-floodplain forest
-bog
-alder thicket
-sedge meadow
-coniferous forest
-fen

Estimated size of wetland in acres: 14.5 Size of wetland lost in acres: 1.5 Ratio: 9.6/1

SUMMARY OF FUNCTIONAL VALUES
Based on the results of the attached functional assessment, rate the significance of each of the functional values for the subject wetland and check the appropriate box. Complete the table as the summary.

	SIGNIFICANCE:				
FUNCTION:	Low	Medium	High	Exceptional	n/a
Floral Diversity:			X		
Wildlife Habitat:			X		
Fishery Habitat:		X			
Flood/Stormwater Attenuation:			X		
Water Quality Protection:			X		
Shoreline Protection:		X			
Groundwater:		X			
Aesthetics/Recreation/Education:		X			

Table 10

List any Special Features/ "Red Flags"

SITE DESCRIPTION

I. HYDROLOGIC SETTING

A. Describe the geomorphology of the wetland:

___ Depressional (includes slopes, potholes, small lakes, kettles, etc.)
__X__ Riverine
___ Lake Fringe
___ Extensive Peatland

B. Y __X__ , N ____ -Has the wetland hydrology been altered by ditching, tiles, dams, culverts, well pumping, diversion of surface flow, or change to runoff within the watershed (underline those that apply)?

C. Y __X__ , N ____ -Does the wetland have an inlet, outlet, or both (underline those that apply)?

D. Y __X__ , N ____ -Is there any field evidence of wetland hydrology such as buttressed tree trunks, adventitous roots, drift lines, water marks, water stained leaves, soil mottling gleying, organic soils layer, or oxidized rhizopheres (underline those that apply)?

E. Y __X__ , N ____ -Does the wetland have standing water, and if so what is the average depth in inches? __5__ Approximately how much of the wetland is inundated? __75__%

F. How is the hydroperiod (seasonal water level pattern) of the wetland classified?

___ Permanently Flooded
___ Seasonally Flooded (water absent at end of growing season)
___ Saturated (surface water seldom present)
__X__ Artificially Flooded (Seasonally)
___ Artificially Drained

G. Y ___ , N __X__ -Is the wetland a navigable body of water or is a portion of the wetland below the ordinary highwater mark of a navigable water body? List any surface waters associated with the wetland or in proximity to the wetland (note approximate distance from the wetland and navigability determination). Note if there is a surface water connection to other wetlands. *-Little Cicero Creek, 10-20 feet within wetland.*

II. VEGETATION

A. Identify the vegetation communities present and the dominant species (all are native species unless otherwise noted).

-floating leaved community dominated by:
-submerged aquatic community dominated by:
-**emergent community dominated by**: Reed Canary Grass *(Phalaris arundinacea)* OBL (exotic)
& Rice Cutgrass *(Leersia oryzoides)* OBL
-shrub community dominated by:
-deciduous broad-leaved tree community dominated by:
-coniferous tree community dominated by:
-open sphagnum mat or bog
-sedge meadow/wet prairie community dominated by:
-other (explain):

B. Other plant species identified during site visit:
Refer to Table 1 on Page 41 for plant classification system.

-Queen Anne's Lace *(Daucus carota)* FACU
-Black Willow *(Salix nigra)* OBL-FACW
-Spike Rush *(Eleocharis obtusa)* OBL
-Arrowhead *(Sagittaria latifolia)* OBL
-Swamp Milkweed *(Asclepias incarnata)* OBL
-Ditch Stonecrop *(Penthorum sedoides)* OBL
-Monkey Flower *(Mimulus ringens)* OBL
-Cattail *(Typha latifolia)* OBL
-Sedges *(Carex sp.)* OBL-FAC

III. SOILS

A. SCS Soil Map Classification:
Genesee Silt Loam & Shoals Silt Loam
B. Field Description:
___ Organic (histosol) ? If so, is it a muck or a peat?
__X__ Mineral soil?

- Mottling, gleying, sulfidic materials, iron or manganese concretions, organic streaking (underline those that apply)?
- Soil Description:
Genesee series – Deep, well drained, moderately permeable soils on flood plains.
Shoals series – Deep, somewhat poorly drained, moderately permeable soils on flood plains.
- Depth of mottling/gleying: *Soil survey mentions mottles to C4 –52 to 56 inches.*
- Depth of A Horizon: *Sample not deep enough to tell.*
- Munsell Color of the matrix and mottles
  -Matrix below the A horizon (10" depth): *10YR 3/2 & 10YR 4/2 within first 5 inches.*
  -Mottles: _____

V. SURROUNDING LAND USES

A. What is the estimated area (with Little Cicero Creek Included) of the wetland watershed in acres? __200__

B. What are the surrounding land uses?
-Agricultural with some residential development.

LAND-USE	ESTMATED % OF WETLAND WATERSHED
Developed: (Industrial/Commercial/Residential)	10
Agricultural/cropland:	20
Agricultural/grazing:	10
Forested:	50
Grassed recreation areas/parks:	0
Old field:	5
Highways or roads:	5
Other (specify):	

Table 11

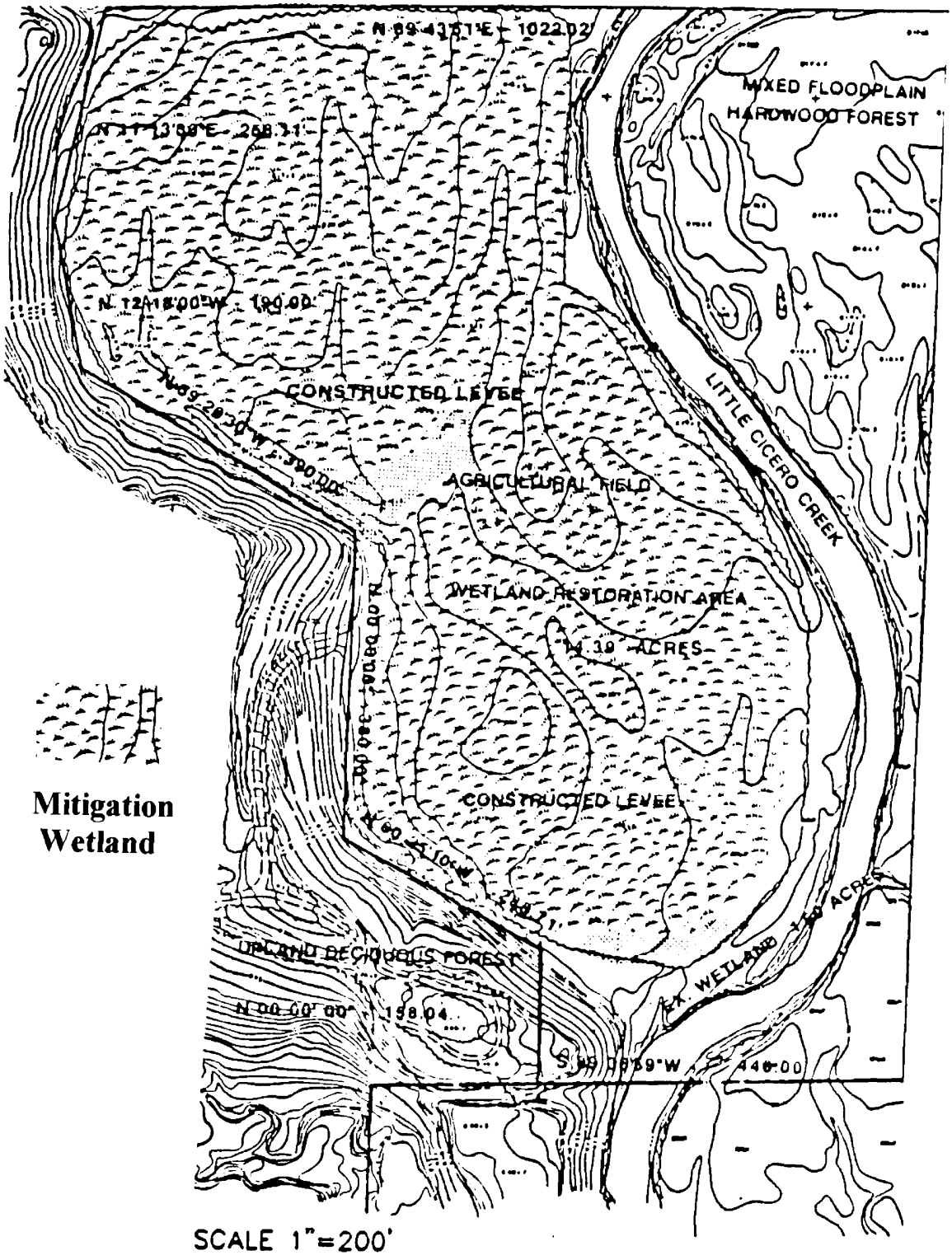

MIXED FLOODPLAIN HARDWOOD FOREST
CONSTRUCTED LEVEE
LITTLE CICERO CREEK
AGRICULTURAL FIELD
WETLAND RESTORATION AREA
14.39 ACRES
CONSTRUCTED LEVEE
UPLAND DECIDUOUS FOREST
EX. WETLAND
Mitigation Wetland
SCALE 1"=200'

Figure 11

FUNCTIONAL ASSESSMENT

The following assessment requires the evlauator to examine site conditions that provide evidence that a given functional value is present and to assess the significance of the wetland to perform those functions. Positive answers to the questions are not definitive and are only provided to guide the evaluation. After completing each section, the evaluator should consider the factors observed and use best professional judgement to rate the significance. The ratings should be recorded on page 1 of the assessment.

Special Features/ RED FLAGS

1. Y ____ , N __X__ -Is the wetland in or adjacent to an area of special natural resource interest? If so, check those that apply:

	a. Cold water community as defined in state code. (including trout streams, their tributaries, and trout lakes);
	b. Lakes Michigan and Superior and the Mississippi River;
	c. State or federal designated wild and scenic river;
	d. Designated state riverway;
	e. Designated state scenic urban waterway;
	f. Environmentally sensitive area or environmental corridor identified in an area-wide water quality mangement plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
	g. Calcereous fen;
	h. State park, forest, trail or recreation area;
	i. State and federal fish and wildlife refuges and fish and wildlife mangement areas;
	j. State and federal designated wilderness area;
	k. Designated or dedicated state natural area;
	l. Wild rice water listed in state code;
	m. Surface water identified as an outstanding or exceptional use water in state code.

Table 12

2. Y ____ , N __X__ -According to the Natural Heritage Inventory (Bureau of Endangered Resources) or direct observations, are there any rare, endangered, or threatened plant or animal species in, near, or using the wetland or adjacent lands? If so, list the species of concern: - *There is no information on ESA species on this site.*

3. Y ____ , N __X__ -Is the project located in an area that requires a State Coastal Zone Mangement Plan consistency determination?

Floral Diversity

1. Y ___ , N __X__ -Does the wetland support a variety of native species (i.e. not a monotypic stand of cattail or giant reed grass and/or not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc.) ?

2. Y ____ , N __X__ -Is the wetland plant community regionally scare or rare?

Wildlife and Fishery Habitat

1. List any species observed, evidenced (e.g. tracks, scat, nest/burrow, calls), or expected to utilize the wetland:
   -Great Blue Heron, ducks, frogs and deer.

2. Y ____ , N __X__ -Does the wetland contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types?

3. Y ____ , N __X__ -Is the estimated ratio of open water to cover between 30 and 70 percent? What is the estimated ratio? __10__%

4. Y __X__ , N ____ -Does the surrounding upland habitat likely support a variety of animal species?

5. Y __X__ , N ____ -Is the wetland part of or associated with a wildlife corridor or designated wildlife corridor?

6. Y ____ , N __X__ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land important for wildlife that require large home ranges (e.g. bear, woodland passerines)?

7. Y __X__ , N _____ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land within an urbanized environment that is important for wildlife?

8. Y __X__ , N ____-Are there other wetland areas near the subject wetland that may be important to wildlife?

9. Y __X__ , N ___ -Is the wetland contiguous with a permanent waterbody or is it periodically inundated for sufficient periods of time to provide spawning/nursery habitat for fish?

10. Y __X__ , N ____-Can the wetland provide significant food base for fish and wildlife (e.g. insects, crustaceans, voles, forage fish, amphibians, reptiles, shrews, wild rice, wild celery, duckweed, pondweeds, watermeal, bulrushes, bur reeds, arrowhead, smartweeds, millets...)?

11. Y ____ , N __X__ -Is the wetland located in a priority watershed/township as identified in the Upper Mississippi and Great Lakes Joint Venture of the North American Waterfowl Mangement Plan?

12. Y __X__ , N ____-Is the wetland providing habitat that is scarce to the region?

Flood and Stormwater Storage/Attenuation

1. Y __X__ , N ____ -Are there steep slopes, large impervious areas, moderate slopes with row cropping, or areas with severe overgrazing within the watershed (underline those that apply)?

2. Y __X__ , N ____-Does the wetland significantly reduce run-off velocity due to its size, configuration, braided flow patterns, or vegetation type density?

3. Y __X__ , N ____ -Does the wetland show evidence of flashy water level responses to storm events (debris marks, erosion lines, stormwater inputs, channelized inflow)?

4. Y __X__ , N ____-Is there a natural feature or human-made structure impeding drainage from the wetland that causes backwater conditions?
   -Levees.

5. Y ____ , N __X__-Considering the size of the wetland area in relation to the size of its watershed, at any time during the year is water likely to reach the wetland's storage capacity (i.e. the level of easily observable wetland vegetation)? [For some cases where greater documentation is required, one should determine if the wetland has capacity to hold 25% of the run-off from a 2 year-24 hour storm event.]

6. Y __X__ , N ____-Considering the location of the wetland in relation to the associated surface water watershed, is the wetland important for attenuating or storing flood or stormwater peaks (i.e. is the wetland located in the mid or lower reaches of the watershed)?

Water Quality Protection

1. Y ____ , N __X__ -Does the wetland receive overland flow or direct discharge of stormwater as a primary source of water (underline that which applies)?
   -Primary source of water is artificial flooding.

2. Y __X__ , N ____ -Do the surrounding land uses have the potential to deliver significant nutrient and/or sediment loads to the wetland?

3. Y __X__ , N ____-Based on your answers to the flood/stormwater section above, does the wetland perform significant flood/stormwater attenuation (residence time to allow settling)?

4. Y __X__ , N ____-Does the wetland have significant vegetative density to decrease water energy and allow settling of suspended materials?

5. Y __X__ , N ____-Is the position of the wetland in the landscape such that run-off is held or filtered before entering a surface water?

6. Y ____ , N __X__ -Are algal blooms, heavy macrophyte growth, or other signs of excess nutrient loading to the wetland apparent (or historically reported)?

Shoreline Protection

1. Y __X__ , N ____ -Is the wetland in a lake fringe or riverine setting? If NO, STOP And enter "not applicable" for this section. If YES, then answer the applicable questions.

2. Y ____ , N __X__ -Is the shoreline exposed to constant wave action caused by a long wind fetch or boat traffic?

3. Y ____ , N __X__ -Is the shoreline and shallow littoral zone vegetated with submerged or emergent vegetation in the swash zone that decrease wave energy or perennial wetland species that form dense root mats and/or species that have strong stems that are resistant to erosive forces?

4. Y ____ , N __X__ -Is the stream bank prone to erosion due to unstable soils, land uses, or ice floes?

5. Y __X__ , N ____ -Is the stream bank vegetated with densely rooted shrubs that provide upper bank stability?

Groundwater Recharge and Discharge

1. Y ____ , N __X__ -Related to discharge, are there observable (or reported) springs located in the wetland, physical indicators of springs such as marl soil, or vegetation indicators such as watercress or marsh marigold present that tend to indicate the presence of groundwater springs?

2. Y __X__ , N ____ -Related to discharge, may the wetland contribute to the maintenance of base flow in a stream?
-Possible during seasonal/artificial flooding.

3. Y __X__ , N ___ -Related to recharge, is the wetland located on or near a groundwater divide (e.g. a topographic high)?

Aesthetics/Recreation/Education and Science

1. Y ____ , N __X__ -Is the wetland visible from any of the following kinds of points: roads, public land, houses, and/or businesses? (Underline all that apply.)

2. Y ____ , N __X__ -Is the wetland in or near any population centers?

3. Y __X__ , N ____ -Is any part of the wetland in public or conservation ownership?
-Owned by duck conservation group.

4. Y ____ , N __X__ -Does the public have direct access to the wetland from public roads or waterways? (Underline those that apply.)

Aesthetics/Recreation/Education and Science (continued)

5. Is the wetland itself relativeley free of obvious human influences, such as:

   a. Y __X__ , N ____ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?
   d. Y __X__ , N ____ -Trash?
   e. Y __X__ , N ____ -Pollution?
   f. Y __X__ , N ____ -Filling?
   g. Y __X__ , N ____ -Dredging/draining?
   h. Y __X__ , N ____ -Domination by non-native vegetation?

6. Is the surrounding viewshed relatively free of obvious human influences, such as:

   a. Y __X__ , N ____ -Buildings?
   b. Y __X__ , N ____ -Roads?
   c. Y __X__ , N ____ -Other structures?

7. Y ____ , N __X__ -Is the wetland organized into a variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water)?

8. Y __X__ , N ____ -Does the wetland add to the variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water) within the landscape as a whole?

9. Y __X__ , N ____ -Does the wetland encourage exploration because any of the following factors are present:

   a. Y __X__ , N ____ -Long views within the wetland?
   b. Y ____ , N __X__ -Long views in the viewshed adjacent to the wetland?
   c. Y __X__ , N ____ -Convoluted edges within and/or around the wetland border?

10. Y __X__ , N ____ -Is the wetland currently being used for (or does it have the potential to be used for) the following recreational activities? (Check all that apply.)

ACTIVITY:	CURRENT USE:	POTENTIAL USE:
Nature study/photography:		X
Hiking/biking/skiing:		
Hunting/fishing/trapping:	X	
Boating/canoeing:		
Food harvesting:		
Others (list):		

Table 13

11. Y __X__ , N ____ -Is the wetland currently being used, and/or does it have the potential for use for educational or scientific study purposes (underline those that apply)? *-Not currently being used, but certainly does possesses excellent wetland characteristics for potential educational audiences.*

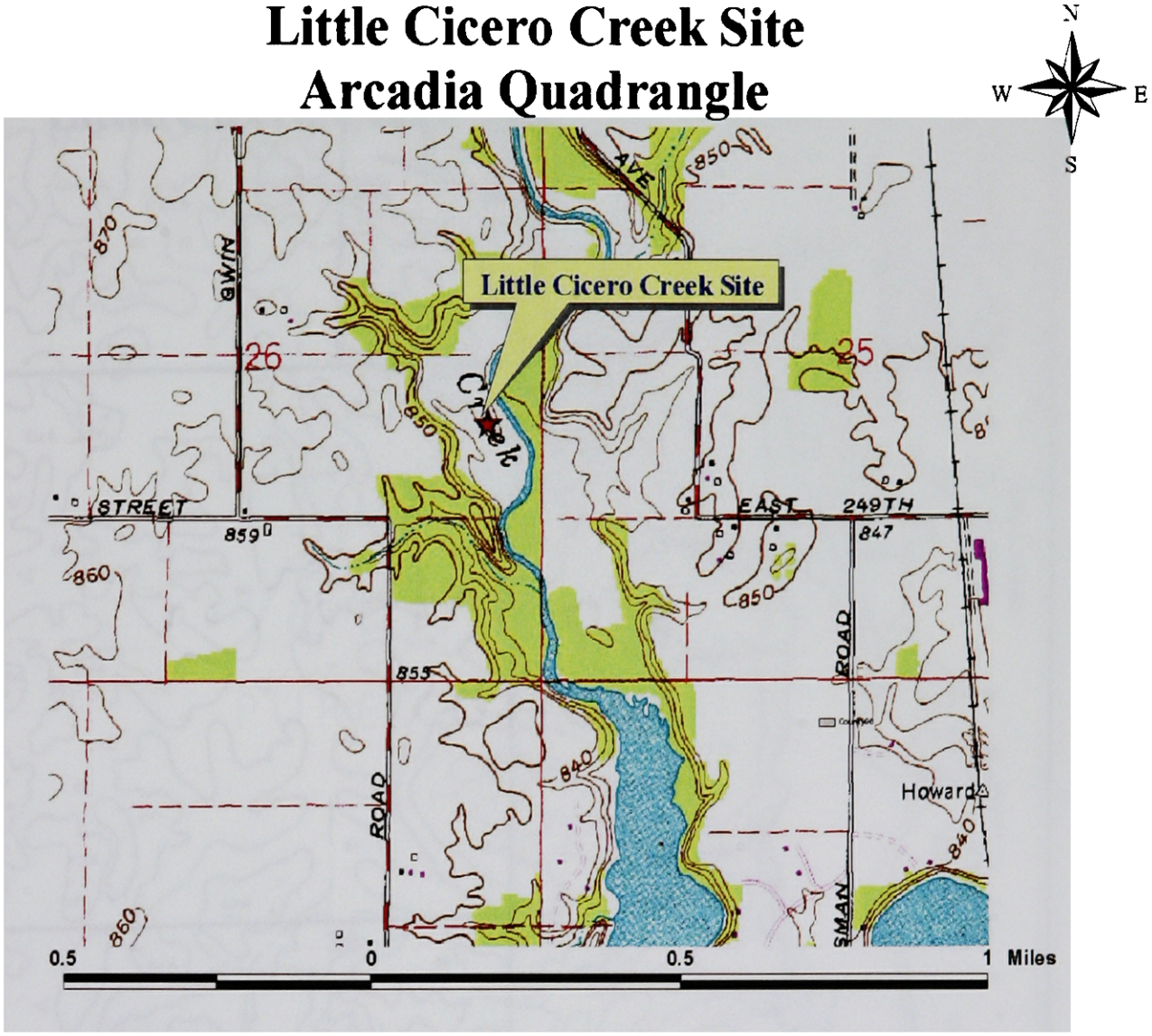


Figure 12

Location Map of Little Cicero Creek Site

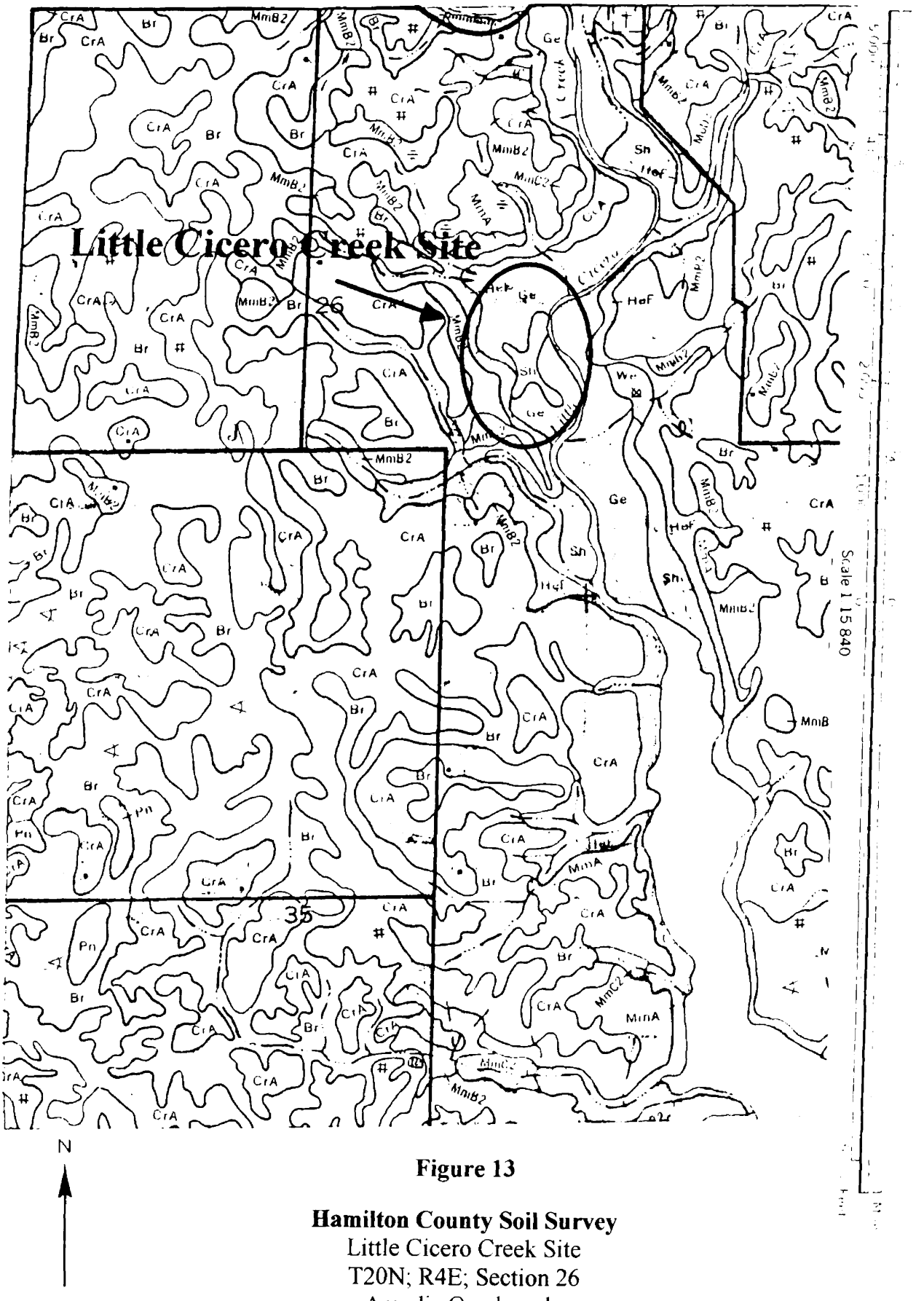


Figure 13

Hamilton County Soil Survey
Little Cicero Creek Site
T20N; R4E; Section 26
Arcadia Quadrangle

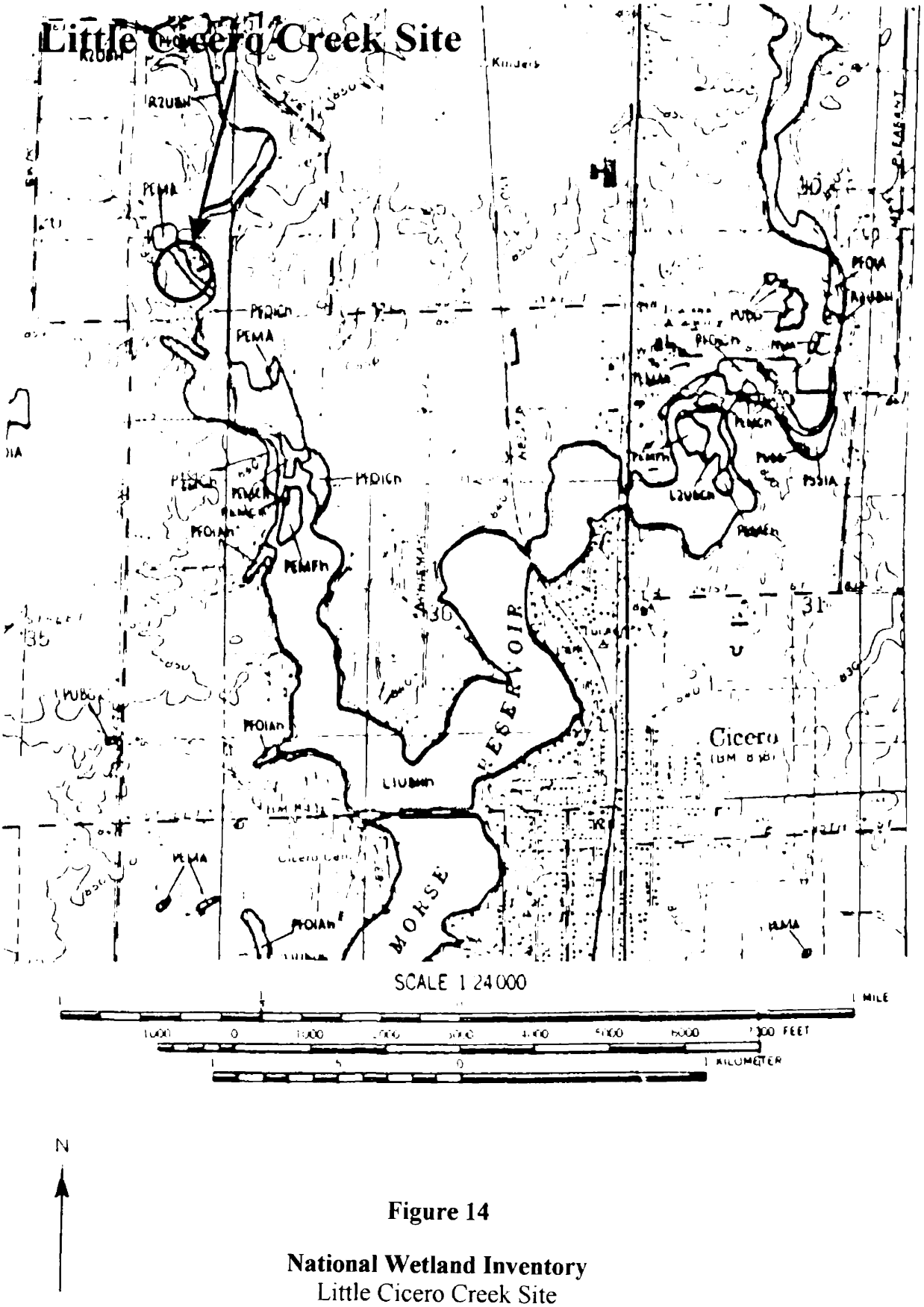


Figure 14

National Wetland Inventory
Little Cicero Creek Site
T20N; R4E; Section 26
Arcadia Quadrangle

Greenwood Site

Wisconsin Department of Natural Resources

RAPID ASSESSMENT METHODOLOGY FOR EVALUATING
WETLAND FUNCTIONAL VALUES

GENERAL INFORMATION
Name of Wetland/Owner: Greenwood Site
Location. County: Johnson, Greenwood Quadrangle, Section: 5
Township: T 13N, Range: R 4E
Project Name/Evaluator(s): Greenwood/Mike Hasty
Date(s) of Site Visit(s): May 1999, June 27, 1999, October 16, 1999, May 7, 2000

Description of seasonality limitations of the inspection(s) due to time of year of the evaluation(s) and/or current hydrologic and climatologic conditions (e.g. after heavy rains snow or ice cover, during drought year, during spring flood, during bird migration):
-During drought year.

WETLAND DESCRIPTION
Wisconsin Wetland Inventory Classification:
Wetland Type (of mitigation wetland):

-shallow open water (type identified on site)
-wet meadow
-deep marsh
-shrub-carr
-shallow marsh
-low prairie
-seasonally flooded basin
-hardwood swamp
-floodplain forest
-bog
-alder thicket
-sedge meadow
-coniferous forest
-fen

Estimated size of wetland in acres: 0.68 Size of wetland lost in acres: 0.94 Ratio: .72/1 (-ratio)

SUMMARY OF FUNCTIONAL VALUES
Based on the results of the attached functional assessment, rate the significance of each of the functional values for the subject wetland and check the appropriate box. Complete the table as the summary.

	SIGNIFICANCE:				
FUNCTION:	Low	Medium	High	Exceptional	n/a
Floral Diversity:	X				
Wildlife Habitat:	X				
Fishery Habitat:		X			
Flood/Stormwater Attenuation:		X			
Water Quality Protection:	X				
Shoreline Protection:					X
Groundwater:	X				
Aesthetics/Recreation/Education:	X				

Table 14

List any Special Features/ "Red Flags":

SITE DESCRIPTION

I. HYDROLOGIC SETTING

A. Describe the geomorphology of the wetland:

_X_ Depressional (includes slopes, potholes, small lakes, kettles, etc.)
___ Riverine
___ Lake Fringe
___ Extensive Peatland

B. Y _X_ , N ____ -Has the wetland hydrology been altered by ditching, tiles, dams, culverts, well pumping, diversion of surface flow, or change to runoff within the watershed (underline those that apply)?

C. Y _X_ , N ____ -Does the wetland have an inlet, outlet, or both (underline those that apply)?

D. Y _X_ , N ____ -Is there any field evidence of wetland hydrology such as buttressed tree trunks, adventitious roots, drift lines, water marks, water stained leaves, soil mottling gleying, organic soils layer, or oxidized rhizopheres (underline those that apply)?

E. Y _X_ , N ____ -Does the wetland have standing water, and if so what is the average depth in inches? _15"_ Approximately how much of the wetland is inundated? _85_%

F. How is the hydroperiod (seasonal water level pattern) of the wetland classified?

_X_ Permanently Flooded
___ Seasonally Flooded (water absent at end of growing season)
___ Saturated (surface water seldom present)
___ Artificially Flooded
___ Artificially Drained

G. Y ___ , N _X_ -Is the wetland a navigable body of water or is a portion of the wetland below the ordinary highwater mark of a navigable water body? List any surface waters associated with the wetland or in proximity to the wetland (note approximate distance from the wetland and navigability determination). Note if there is a surface water connection to other wetlands.

II. VEGETATION

A. Identify the vegetation communities present and the dominant species (all are native species unless otherwise noted).

-floating leaved community dominated by:
-submerged aquatic community dominated by:
-**emergent community dominated by**: Cattails *(Typha latifolia)* OBL
-shrub community dominated by:
-deciduous broad-leaved tree community dominated by:
-coniferous tree community dominated by:
-open sphagnum mat or bog
-sedge meadow/wet prairie community dominated by:
-other (explain):

B. Other plant species identified during site visit:
Refer to Table 1 on Page 41 for plant classification system.

-Fragrant Goldenrod *(Solidago graminifolia)* FACW-
-Cottonwood *(Populus deltoides)* FAC+
-Softstem Bulrush *(Scriptus validus)* OBL
-Willow *(Salix exigua)* OBL

III. SOILS

A. SCS Soil Map Classification:
Crosby Silt Loam

B. Field Description:

___ Organic (histosol) ? If so, is it a muck or a peat?

X Mineral soil?

- Mottling, gleying, sulfidic materials, iron or manganese concretions, organic streaking (underline those that apply)?
- Soil Description:
  Crosby series –Deep, nearly level and gently sloping, somewhat poorly drained soils that formed in loess and the underlying calcareous glacial till.
- Depth of mottling/gleying: *Soil survey identifies mottles to C – 36 to 60 inches.*
- Depth of A Horizon: *Around 13 inches.*
- Munsell Color of the matrix and mottles
  -Matrix below the A horizon (10" depth): *10YR 4/2*
  -Mottles: *10YR 4/4*

V. SURROUNDING LAND USES

A. What is the estimated area of the wetland watershed in acres? __10-20__

B. What are the surrounding land uses?
-Primarily commercial use.

LAND-USE	ESTIMATED % OF WETLAND WATERSHED
Developed: (Industrial/Commercial/Residential)	80
Agricultural/cropland:	0
Agricultural/grazing:	0
Forested:	5
Grassed recreation areas/parks:	0
Old field:	5
Highways or roads:	10
Other (specify):	

Table 15

VI. SITE SKETCH

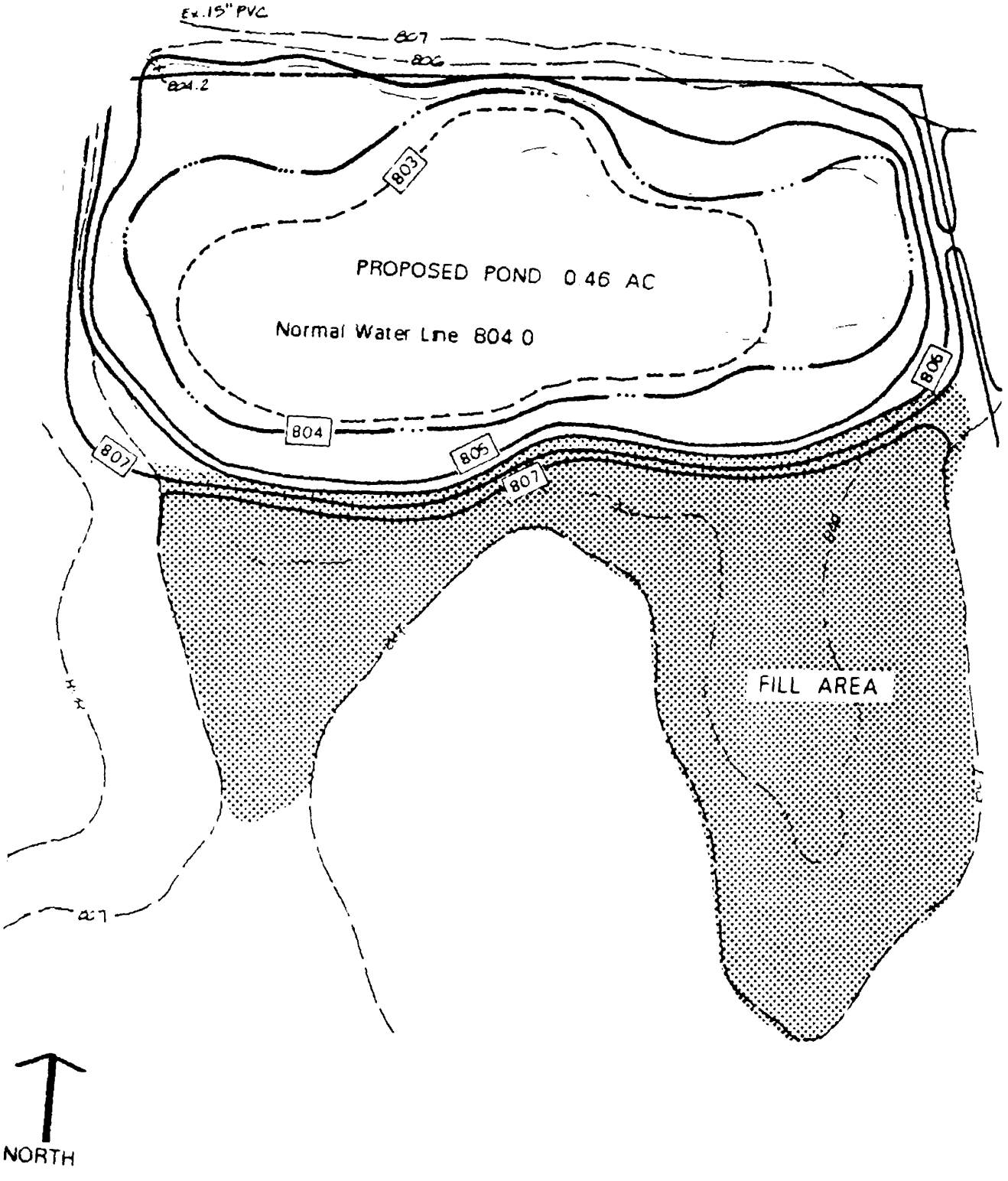


Figure 15

FUNCTIONAL ASSESSMENT

The following assessment requires the evaluator to examine site conditions that provide evidence that a given functional value is present and to assess the significance of the wetland to perform those functions. Positive answers to the questions are not definitive and are only provided to guide the evaluation. After completing each section, the evaluator should consider the factors observed and use best professional judgment to rate the significance. The ratings should be recorded on page 1 of the assessment.

Special Features/ RED FLAGS

1. Y ___ , N __X__ -Is the wetland in or adjacent to an area of special natural resource interest? If so, check those that apply:

	a. Cold water community as defined in state code. (including trout streams, their tributaries, and trout lakes);
	b. Lakes Michigan and Superior and the Mississippi River;
	c. State or federal designated wild and scenic river;
	d. Designated state riverway;
	e. Designated state scenic urban waterway;
	f. Environmentally sensitive area or environmental corridor identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
	g. Calcereous fen;
	h. State park, forest, trail or recreation area;
	i. State and federal fish and wildlife refuges and fish and wildlife management areas;
	j. State and federal designated wilderness area;
	k. Designated or dedicated state natural area;
	l. Wild rice water listed in state code;
	m. Surface water identified as an outstanding or exceptional use water in state code.

Table 16

2. Y ____ , N __X__ -According to the Natural Heritage Inventory (Bureau of Endangered Resources) or direct observations, are there any rare, endangered, or threatened plant or animal species in, near, or using the wetland or adjacent lands? If so, list the species of concern:

3. Y ____ , N __X__ -Is the project located in an area that requires a State Coastal Zone Mangement Plan consistency determination?

Floral Diversity

1. Y ____ , N _X_ -Does the wetland support a variety of native species (i.e. not a monotypic stand of cattail or giant reed grass and/or not dominated by exotic species such as reed canary grass, brome grass, buckthorn, purple loosestrife, etc.) ?

2. Y ____ , N _X_ -Is the wetland plant community regionally scare or rare?

Wildlife and Fishery Habitat

1. List any species observed, evidenced (e.g. tracks, scat, nest/burrow, calls), or expected to utilize the wetland:
   -Birds and frogs.

2. Y ____ , N _X_ -Does the wetland contain a number of diverse vegetative cover types and a high degree of interspersion of those vegetation types?

3. Y _X_ , N ____ -Is the estimated ratio of open water to cover between 30 and 70 percent? What is the estimated ratio? _80/20_ %

4. Y ____ , N _X_ -Does the surrounding upland habitat likely support a variety of animal species?

5. Y ____ , N _X_ -Is the wetland part of or associated with a wildlife corridor or designated wildlife corridor?

6. Y ____ , N _X_ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land important for wildlife that require large home ranges (e.g. bear, woodland passerines)?

7. Y ____ , N _X_ -Is the surrounding habitat and/or the wetland itself a large tract of undeveloped land within an urbanized environment that is important for wildlife?

8. Y ____ , N _X_ -Are there other wetland areas near the subject wetland that may be important to wildlife?

9. Y_X_ , N ____ -Is the wetland contiguous with a permanent waterbody or periodically inundated for sufficient periods of time to provide spawning/nursery habitat for fish?

10. Y_X_ , N ____ -Can the wetland provide significant food base for fish and wildlife (e.g. insects, crustaceans, voles, forage fish, amphibians, reptiles, shrews, wild rice, wild celery, duckweed, pondweeds, watermeal, bulrushes, bur reeds, arrowhead, smartweeds, millets...)?

11. Y ____ , N _X_ -Is the wetland located in a priority watershed/township as identified in the Upper Mississippi and Great Lakes Joint Venture of the North American Waterfowl Management Plan?

12. Y ____ , N _X_ -Is the wetland providing habitat that is scarce to the region?

Flood and Stormwater Storage/Attenuation

1. Y __X__ , N ___ -Are there steep slopes, large impervious areas, moderate slopes with row cropping, or areas with severe overgrazing within the watershed (underline those that apply)?

2. Y __X__ , N ___ -Does the wetland significantly reduce run-off velocity due to its size, configuration, braided flow patterns, or vegetation type density?

3. Y __X__ , N ___ -Does the wetland show evidence of flashy water level responses to storm events (debris marks, erosion lines, stormwater inputs, channelized inflow)?

4. Y __X__ , N ___ -Is there a natural feature or human-made structure impeding drainage from the wetland that causes backwater conditions?
   -No outflow area, creates pond like environment (eutrophic conditions).

5. Y __X__ , N ___ -Considering the size of the wetland area in relation to the size of its watershed, at any time during the year is water likely to reach the wetland's storage capacity (i.e. the level of easily observable wetland vegetation)? [For some cases where greater documentation is required, one should determine if the wetland has capacity to hold 25% of the run-off from a 2 year-24 hour storm event.] *-Small size of pond in relation to paved and developed surfaces suggests that the pond exceeds its capacity during heavy rainfall events.*

6. Y __X__ , N ___ -Considering the location of the wetland in relation to the associated surface water watershed, is the wetland important for attenuating or storing flood or stormwater peaks (i.e. is the wetland located in the mid or lower reaches of the watershed)?
   -Important to adjacent auto dealer and storage unit from flooding.

Water Quality Protection

1. Y __X__ , N ___ - Does the wetland receive overland flow or direct discharge of stormwater as a primary source of water (underline that which applies)?

2. Y __X__ , N ___ -Do the surrounding land uses have the potential to deliver significant nutrient and/or sediment loads to the wetland?

3. Y __X__ , N ___ -Based on your answers to the flood/stormwater section above, does the wetland perform significant flood/stormwater attenuation (residence time to allow settling)?

4. Y ___ , N __X__ -Does the wetland have significant vegetative density to decrease water energy and allow settling of suspended materials?

5. Y __X__ , N ___ -Is the position of the wetland in the landscape such that run-off is held or filtered before entering a surface water?

6. Y __X__ , N ___ -Are algal blooms, heavy macrophyte growth, or other signs of excess nutrient loading to the wetland apparent (or historically reported)?

Shoreline Protection

1. Y ____ , N __X__ -Is the wetland in a lake fringe or riverine setting? If NO, STOP And enter "not applicable" for this section. If YES, then answer the applicable questions.

2. N/A __X__ -Is the shoreline exposed to constant wave action caused by a long wind fetch or boat traffic?

3. N/A __X__ -Is the shoreline and shallow littoral zone vegetated with submerged or emergent vegetation in the swash zone that decrease wave energy or perennial wetland species that form dense root mats and/or species that have strong stems that are resistant to erosive forces?

4. N/A __X__ -Is the stream bank prone to erosion due to unstable soils, land uses, or ice floes?

5. N/A __X__ -Is the stream bank vegetated with densely rooted shrubs that provide upper bank stability?

Groundwater Recharge and Discharge

1. Y ____ , N __X__ -Related to discharge, are there observable (or reported) springs located in the wetland, physical indicators of springs such as marl soil, or vegetation indicators such as watercress or marsh marigold present that tend to indicate the presence of groundwater springs?

2. Y ____ , N __X__ -Related to discharge, may the wetland contribute to the maintenance of base flow in a stream?

3. Y ____ , N __X__ -Related to recharge, is the wetland located on or near a groundwater divide (e.g. a topographic high)?

Aesthetics/Recreation/Education and Science

1. Y __X__ , N ____ -Is the wetland visible from any of the following kinds of points: roads, public land, houses, and/or businesses? (Underline all that apply.)

2. Y __X__ , N ____ -Is the wetland in or near any population centers?

3. Y ____ , N __X__ -Is any part of the wetland in public or conservation ownership?

4. Y ____ , N __X__ -Does the public have direct access to the wetland from public roads or waterways? (Underline those that apply.)

Aesthetics/Recreation/Education and Science (continued)

5. Is the wetland itself relatively free of obvious human influences, such as:

   a. Y ____ , N __X__ -Buildings?
   b. Y ____ , N __X__ -Roads?
   c. Y ____ , N __X__ -Other structures?
   d. Y ____ , N __X__ -Trash?
   e. Y ____ , N __X__ -Pollution?
   f. Y ____ , N __X__ -Filling?
   g. Y ____ , N __X__ -Dredging/draining?
   h. Y __X__ , N ____ -Domination by non-native vegetation?

6. Is the surrounding viewshed relatively free of obvious human influences, such as:

   a. Y ____ , N __X__ -Buildings?
   b. Y ____ , N __X__ -Roads?
   c. Y ____ , N __X__ -Other structures?

7. Y __X__ , N ____ -Is the wetland organized into a variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water)?

8. Y __X__ , N ____ -Does the wetland add to the variety of visibly separate areas of similar vegetation, color, and/or texture (including areas of open water) within the landscape as a whole?

9. Y ____ , N __X__ -Does the wetland encourage exploration because any of the following factors are present:

   a. Y ____ , N __X__ -Long views within the wetland?
   b. Y ____ , N __X__ -Long views in the viewshed adjacent to the wetland?
   c. Y ____ , N __X__ -Convoluted edges within and/or around the wetland border?

10. Y __X__ , N ____ -Is the wetland currently being used for (or does it have the potential to be used for) the following recreational activities? (Check all that apply.)

ACTIVITY:	CURRENT USE:	POTENTIAL USE:
Nature study/photography:		X
Hiking/biking/skiing:		
Hunting/fishing/trapping:		
Boating/canoeing:		
Food harvesting:		
Others (list):		

Table 17

11. Y ____ , N __X__ -Is the wetland currently being used, and/or does it have the potential for use for educational or scientific study purposes (underline those that apply)? *-Not currently being used and has low interpretation/education value.*

Figure 16

Location Map of Greenwood Site

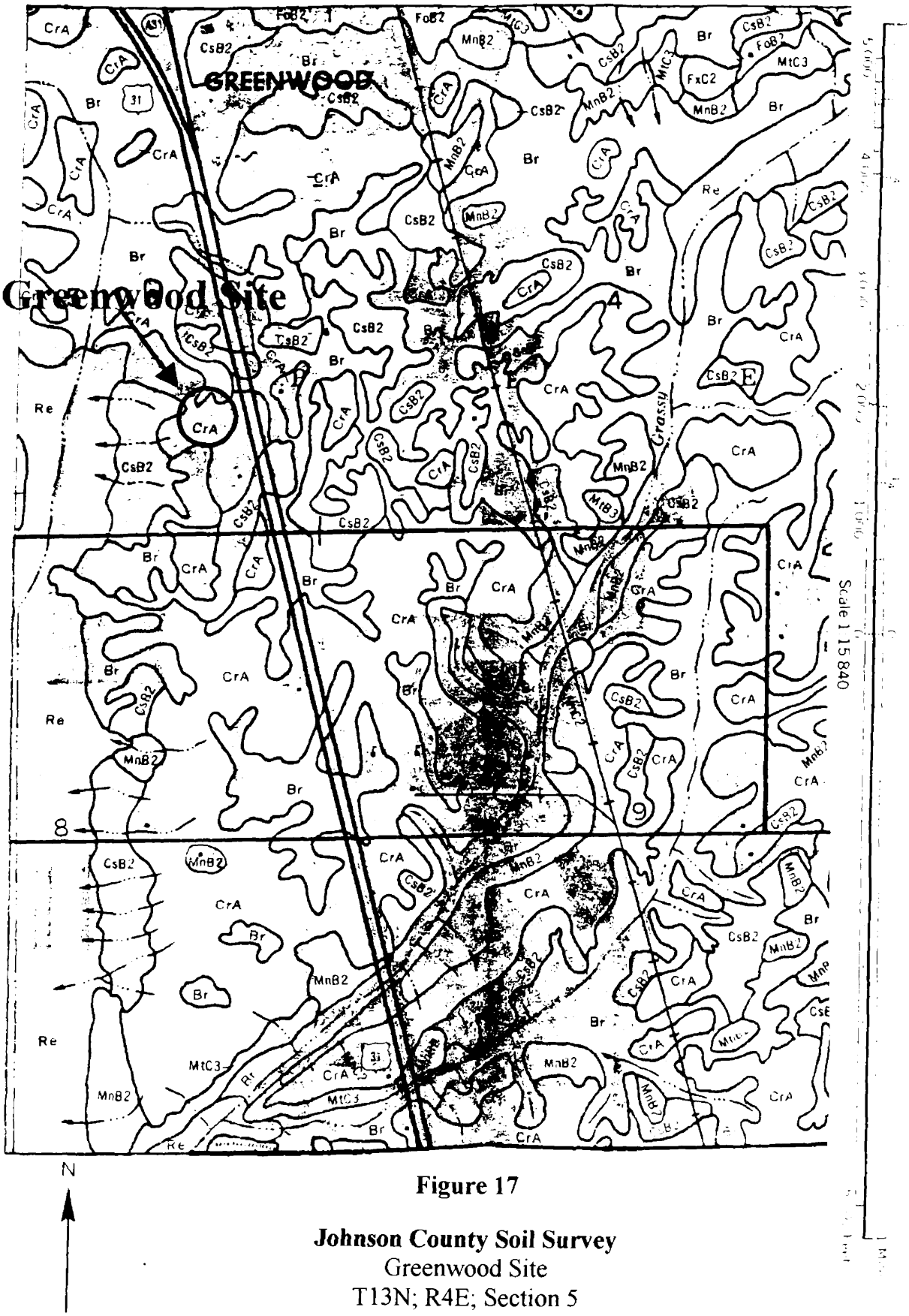


Figure 17

Johnson County Soil Survey
Greenwood Site
T13N; R4E; Section 5
Greenwood Quadrangle

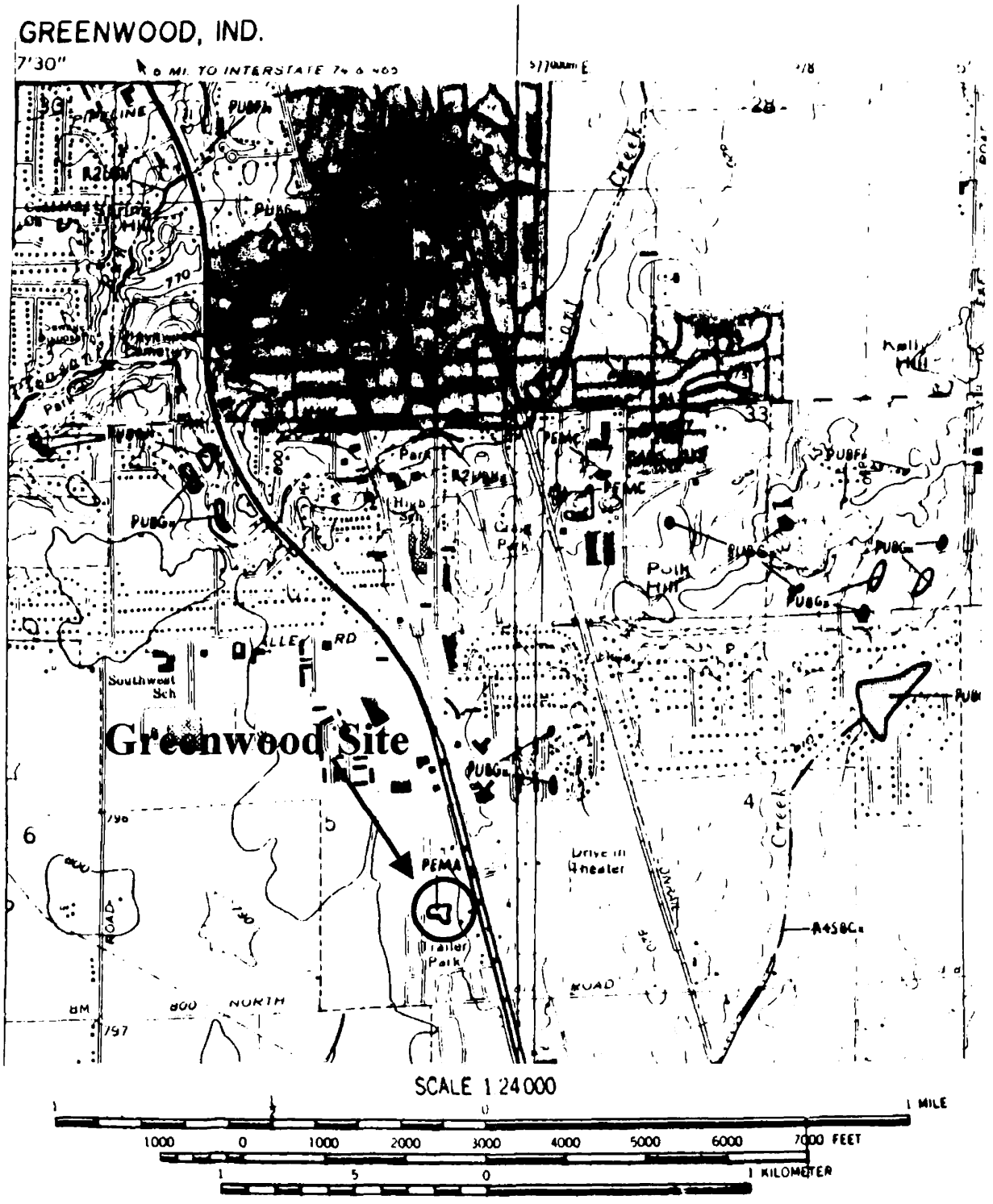


Figure 18

National Wetland Inventory
Greenwood Site
T13N; R4E; Section 5
Greenwood Quadrangle

Appendix B

Bear Slide Golf Course
Around 1 Acre Created / 0.09 Acres Filled
Indiana 401 Water Quality Certification & Nationwide Permit 26

Pebble Brook Golf Community
1.3 Acres Created / 0.90 Acres Filled
Indiana 401 Water Quality Certification & Nationwide Permit 26

Little Cicero Creek Site
14.5 Acres Restored / 1.0 Acre Dredged
401 Water Quality Certification Waived & Corps ATF Permit

Greenwood, IN.
0.68 of an Acre Enhanced / 0.94 of an Acre Filled
Indiana 401 Water Quality Certification

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) **Section, Township, Range, Lat/Lon, and/or Accessors's Parcel Number, for example.**

17. DIRECTIONS TO THE SITE

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

23. Is Any Portion of the Work Already Complete? Yes __ No __ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

Appendix C

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT **OMB APPROVAL NO. 0710-003**
(33 CFR 325) Form Eng 4345

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10: 1413, Section 404. Princal Purpose: These laws require authorizing activities in, or affecting, navigable waters of the United States, the discharge or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO. COMPLETED	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NOs. W/AREA CODE a. Residence b. Business	10. AGENT'S PHONE NOs. W/AREA CODE a. Residence b. Business

11. **STATEMENT OF AUTHORIZATION**

I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE DATE

NAME, LOCATION, AND DESCRIPTION OR PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
15. LOCATION OF PROJECT _____ _____ COUNTY STATE	

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Appendix D

Application for Section 401 Water Quality Certification
State Form # 48598 (2-00)

Office of Water Management
Section 401 Water Quality Certification Program

Application Form and Instructions for Section 401 Water Quality Certification

Note to applicants:

Applicants should also contact the Indiana Department of Natural Resources (DNR) regarding potential permit requirements associated with construction in a floodway or a public freshwater lake. According to 1998 figures, approximately 9% of the projects that required a Section 401 Water Quality Certification also required a permit from the DNR. You can reach the DNR Division of Water at 317-232-4160 or toll free at 1-877-WATER55.

Revised February 14, 2000

Dear Section 401 Water Quality Certification Applicants:

Thank you for doing your part to ensure that we are all good stewards of Indiana's lakes, rivers, streams, and wetlands. We at the Indiana Department of Environmental Management (IDEM) are committed to protecting the integrity of our State's precious aquatic resources.

In accordance with Section 401 of the Clean Water Act (CWA), any applicant for a federal license or permit to conduct any activity that may result in a discharge into waters of the United States must first obtain a Water Quality Certification (WQC) (or waiver) from the state. In general, anyone who is required to obtain a permit from the U.S. Army Corps of Engineers (Corps) to engage in dredging, excavation or filling activities must obtain a WQC.

IDEM's goal is to preserve, protect, and enhance the quality of Indiana's aquatic resources. We want to work with you to find sound ecological solutions that meet your project needs. We have developed an application packet that sets forth the information we need from you to make a decision regarding your project. We believe it is relatively simple to complete.

Please contact us with any questions or concerns you may have. You can reach us at 317-233-8488, or you may reach us through the IDEM Environmental Helpline at 1-800-451-6027. Thank you again for doing your part to ensure that Indiana's aquatic resources are protected for future generations of Hoosiers.

Sincerely,

Matthew C. Rueff
Assistant Commissioner
Office of Water Management

FREQUENTLY ASKED QUESTIONS REGARDING WATER QUALITY CERTIFICATION (WQC)

1. Who needs a WQC?

Any applicant for a federal license or permit to conduct any activity that may result in a discharge into waters of the United States must first obtain a WQC (or waiver) from the state. In general, anyone who is required to obtain a permit from the U.S. Army Corps of Engineers to engage in dredging, excavation or filling activities must obtain a WQC.

2. What is a water of the United States?

Very few waterbodies are not waters of the United States. Waters of the United States include: waters that are or have been used to transport commerce and their tributaries; all interstate waters; and all intrastate waters the use, degradation or destruction of which could affect commerce. This generally includes lakes, rivers, streams, creeks, drainage ditches and wetlands. The Corps can tell you whether the particular waterbody you plan on impacting is a water of the United States.

3. What type of project may require a WQC and Corps permit?

The Corps has the authority to decide which projects require a permit and whether they will qualify for a Nationwide Permit, General Permit, or Individual Permit. The addresses and telephone numbers for the two Corps Districts that have jurisdiction in Indiana are included at the back of this packet. The following are examples of projects that would likely require a Corps permit and WQC: dredging a lake, river, stream, or wetland; filling a lake, river, stream, or wetland; bank stabilization; pond construction in wetlands; and roadway/bridge construction projects involving water crossings.

4. If my project qualifies for a Nationwide Permit from the Corps, do I still need a WQC?

IDEM has given a blanket WQC for some, but not all, of the Nationwide Permits (NWPs) established by the Corps. If IDEM has not given a blanket WQC for the particular NWP the Corps has authorized you to work under, then an individual WQC from IDEM will be necessary. The Corps will inform you if your project needs an individual WQC. You may also request a list of the NWPs for which IDEM has granted certification and NWPs that IDEM has certified with special conditions.

5. How long will it take me to obtain a WQC?

If IDEM receives all the necessary information, then IDEM can usually make a decision on your application within sixty days of receiving it. However, the Clean Water Act authorizes IDEM to take up to a year to make a decision on your application.

6. Is there an application fee for obtaining a WQC?

Currently, there are no fees required for applying for a WQC.

Instructions for Completing the Application for Water Quality Certification

* The numbers below correspond to the numbers on the application form
* If you have questions, please call IDEM's Water Quality Certification Program at 1-800-451-6027 or 317-233-8488
* Print clearly or type
* Attach additional 8 " x 11" sheets if necessary

1. Provide the applicant's name, address, and telephone number. Applicants MUST provide a contact name.

2. Provide the agent's address and telephone information (an agent is anyone representing the applicant on the project, such as an attorney or consultant). Applicants are not required to have an agent.

Provide specific project information relating to the location of the proposed project. Include the Universal Transverse Mercator (UTM) coordinates including the datum (eg. 1927 North American). UTM coordinates can be obtained from the United States Geological Survey (USGS) 7.5-Minute Series Topographic Quadrangle maps.

Give a narrative description of the proposed project and its purpose (i.e., why the project is being proposed).

5. Answer the five questions. If not applicable for the proposed project indicate so in the blank.

Drawing/Plan requirements. All applicants must submit drawings/plans consistent with the specifications under item six.

7. **For all projects involving impacts to wetlands** a Corps of Engineers approved wetland delineation is **required** to enable the department in determining the impacts to water quality associated with the project. Photographs aid the department in deciding if a site investigation is necessary, and how best to locate the impact areas when site investigations are necessary.

8. Applicants are not required to submit the information specified in this section unless directed to do so by the department. However, applicants may submit the the information if they anticipate that such information will be required.

Application for Water Quality Certification

Address all applications or questions to:

Indiana Department of Environmental Management
Section 401 Water Quality Certification Program
100 North Senate Avenue P.O. Box 6015 Indianapolis, Indiana 46206-6015
1-800-451-6027 or 317-233-8488

PLEASE PULL OUT APPLICATION FROM PACKET

Failure to provide the information requested in this application may result in a delay of processing or denial of your application.

For Office use only			
Project Manager:			
Date Received:			
IDEM I.D. Number:			
County:			
1. APPLICANT INFORMATION		**2. AGENT INFORMATION**	
Name of Applicant		Name of Agent	
Mailing address (Street/ PO Box/ Rural Route, City, State, Zip)		Mailing address (Street/ PO Box/ Rural Route, City, State, Zip)	
Daytime Telephone Number		Daytime Telephone Number	
Fax Number		Fax Number	
E-mail address (optional)		E-mail address (optional)	
Contact person: (required)		Contact person:	
3. PROJECT LOCATION			
County		Nearest city or town	
U.S.G.S. Quadrangle map name (Topographic map)		Project street address (if applicable)	
Quarter	Section	Township	Range
Type of aquatic resource(s) to be impacted (lake, river, stream, ditch, wetland, etc. include name if applicable)		Project name or title (if applicable)	
		UTM North	UTM East
Other location descriptions or driving directions			

4. PROJECT PURPOSE and DESCRIPTION	
Use additional sheet(s) if required	
Has any construction been started? YES NO	Anticipated start date
If yes, how much work is completed?	
Project purpose and description	
5. Project Information: Applicants must answer all the following questions.	
What are the linear feet of impacts to the waterbody below the ordinary high water mark (OHWM) and/or bank clearing?	
What is the acreage or square footage of wetlands or other water resources that are proposed to receive a discharge of material (ie. fill), mechanically cleared, or to be excavated?	
What is the area of wetlands or other water resources on the site, in acreage or square feet?	
Describe the type, composition and quantity (in cubic yards) of fill material to be placed in the wetland or below the OHWM of the water to receive the material (wetland or other water to be filled).	
Describe the type, composition and quantity (in cubic yards) of material proposed to be removed from the wetland or below the OHWM of the water resource.	

6. Drawing/Plan Requirements (applicants must provide the following)

a. Top/aerial/overhead view of the project site

b. Cross sectional view

c. North arrow, scale, property boundaries

d. Include wetland delineation boundary (if applicable). Label the impact wetlands as I-1, I-2, etc. and mitigation areas as M-1, etc.

e. Location of all surface waters, including wetlands, proposed works, erosion control measures, existing structures, disposal area for excavated material, fill locations, including quantities, and wetland mitigation (if applicable)

f. Approximate water depths and bottom configurations (if applicable)

g. Provide plans on 8 by 11 inch paper, unless directed otherwise

7. Documentation Requirements (applicants must provide the following)

a. A Corps of Engineers approved wetland delineation for projects with wetland impacts

b. Photographs of the project site. Indicate where they were taken on the overhead view of the project plans

8. Additional information that MAY be required (IDEM will notify you if needed)

a. Erosion control and/or storm water management plans

b. Sediment analysis

c. Wetland mitigation plan including: type, size, location, methods of construction, planting and monitoring plans

d. Species surveys for fish, mussels, plants and threatened or endangered species

e. Any other information IDEM deems necessary to determine the impact to water quality

9. Permitting Requirements

a. Have you applied for an Army Corps of Engineers Section 404 permit? _____ Yes _____ No If yes, please supply the Corps of Engineers ID Number, the Corps of Engineers District, the project manager, and a copy of any correspondence with the Corps. **If no, contact** the Army Corps of Engineers regarding the possible need for a permit application. (See instructions 11.)

b. Have you applied for, received, or been denied any other federal, state, or local permits, variances, licenses, or certifications for this project? Please give the permit name, agency from which it was obtained, permit number, and date of issuance or denial.

10. Adjoining Property Owners and Addresses	
List the names and addresses of landowners adjacent to the property on which your project is located and the names and addresses of other persons (or entities) potentially affected by your project. Use additional sheet(s) if required.	
Name Address City State Zip	Name Address City State Zip
Name Address City State Zip	Name Address City State Zip
Name Address City State Zip	Name Address City State Zip
Name Address City State Zip	Name Address City State Zip
Name Address City State Zip	Name Address City State Zip
11. Signature - Statement of Affirmation	

I hereby request a Water Quality Certification to authorize the activities described in this application. I certify that I am familiar with the information contained in this application and to the best of my knowledge and belief, such information is true and accurate. I certify that I have the authority to undertake and will undertake the activities as described in this application. I am aware that there are penalties for submitting false information. I understand that any changes in project design subsequent to IDEM's granting of WQC are not covered by the WQC, and I may be subject to civil and criminal penalties for proceeding without proper authorization. I agree to allow representatives of the IDEM to enter and inspect the project site. I understand that the granting of other permits by local, state, or federal agencies does not release me from the requirement of obtaining the WQC requested herein before commencing the project.

Applicant's Signature: _____ Date: _____

Instructions continued

9. Provide information regarding your application to the U.S. Army Corps of Engineers. If you have not contacted the Corps of Engineers, please call the Louisville Corps District at 502/582-5607 or the Detroit Corps District at 313/226-6828. Please consult the map on the next page to determine which district your project is located in.

10. Provide information regarding any other federal, state, or local permits, variances, licenses, or certifications required for your project. Please indicate whether they were approved, denied, or are pending.

11. The applicant must sign and date the application.

Where to get additional information

For more information about WQC, contact IDEM at the address below. Please contact the DNR or respective Corps District at the proper address below for questions regarding their programs.

IDEM - Office of Water Management
Section 401 Water Quality Certification Program
P.O. Box 6015, IGCN Room 1255
Indianapolis, IN 46206-6015
317-233-8488 or toll free at 1-800-451-6027
http://www.state.in.us/idem/owm/planbr/wqs/401home.htm

Indiana Department of Natural Resources (DNR)
Division of Water
402 W. Washington Street, Room W200
Indianapolis, IN 46204
317-232-4161 or toll free at 1-877-Water55 (1-877-928-3755)
http://www.state.in.us/dnr/water/

United States Army Corps of Engineers
Detroit District
P.O. Box 1027
Detroit, MI 48231-1027
313-226-2218
http://huron.lre.usace.army.mil

United States Army Corps of Engineers
Louisville District
P.O. Box 59
Louisville, KY 40201-0059
502-582-6461
http://www.lrl.usace.army.mil

Appendix E

MEMORANDUM OF AGREEMENT BETWEEN
The Department of the Army
AND
The Environmental Protection Agency
CONCERNING THE DETERMINATION OF MITIGATION UNDER THE CLEAN WATER ACT SECTION 404(b)(1) GUIDELINES

I.PURPOSE

The United States Environmental Protection Agency (EPA) and the United States Department of the Army (Army) hereby articulate the policy and procedures to be used in the determination of the type and level of mitigation necessary to demonstrate compliance with the Clean Water Act (CWA) Section 404(b)(1) Guidelines ("Guidelines"). This Memorandum of Agreement (MOA) expresses the explicit intent of the Army and EPA to implement the objective of the CWA to restore and maintain the chemical, physical and biological integrity of the Nation's waters, including wetlands. This MOA is specifically limited to the Section 404 Regulatory Program and is written to provide guidance for agency field personnel on the type and level of mitigation which demonstrates compliance with requirements in the Guidelines. The policies and procedures discussed herein are consistent with current Section 404 regulatory practices and are provided in response to questions that have been raised about how the Guidelines are implemented. The MOA does not change the substantive requirements of the Guidelines. It is intended to provide guidance regarding the exercise of discretion under the Guidelines.

Although the Guidelines are clearly applicable to all discharges of dredged or fill material, including general permits and Corps of Engineers (Corps) civil works projects, this MOA focuses on standard permits (33 CFR325(b)(1)).[1] This focus is intended solely to reflect the unique procedural aspects associated with the review of standard permits, and does not obviate the need for other regulated activities to comply fully with the Guidelines. EPA and Army will seek to develop supplemental guidance for other regulated activities consistent with the policies and principles established in this document.

This MOA provides guidance to Corps and EPA personnel for implementing the Guidelines and must be adhered to when considering mitigation requirements for standard permit applications. The Corps will use this MOA when making its determinations of compliance with the Guidelines with respect to mitigation for standard permit applications. EPA will use this MOA in developing its position on compliance with the Guidelines for proposed discharges and will reflect this MOA when commenting on standard permit applications.

II. POLICY

A. The Council on Environmental Quality (CEQ) has defined mitigation in its regulations at 40 CFR 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. The Guidelines establish environmental criteria which must be met for activities to be permitted under Section 404. [2] The type of mitigation enumerated by CEQ are compatible with the requirements of the Guidelines; however, as a practical matter, they can be combined to form three general types: avoidance, minimization and compensatory mitigation. The remainder of this MOA will speak in terms of these general types of mitigation.

B. The Clean Water Act and the Guidelines set forth a goal of restoring and maintaining existing aquatic resources. The Corps will strive to avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources, and for wetlands, will strive to achieve a goal of no overall net loss of values and functions. In focusing the goal on no overall net loss to wetlands only, EPA and Army have explicitly recognized the special significance of the nation's wetlands resources. This special recognition of wetlands resources does not in any manner diminish the value of other waters of the United States, which are often of high value. All waters of the United States, such as streams, rivers, lakes, etc., will be accorded the full measure of protection under the Guidelines, including the requirements for appropriate and practicable mitigation. The determination of what level of mitigation constitutes "appropriate" mitigation is based solely on the values and functions of the aquatic resource that will be impacted. "Practicable" is defined at Section 230.3(q) of the Guidelines.[3] However, the level of mitigation determined to be appropriate and practicable under Section 230.10(d) may lead to individual permit decisions which do not fully meet this goal because the mitigation measures necessary to meet this goal are not feasible, not practicable, or would accomplish only inconsequential reductions in impacts. Consequently, it is recognized that no net loss of wetlands functions and values may not be achieved in each and every permit action. However, it remains a goal of the Section 404 regulatory program to contribute to the national goal of no overall net loss of the nation's remaining wetlands base. EPA and Army are committed to working with others through the Administration's interagency task force and other avenues to help achieve this national goal.

C. In evaluating standard Section 404 permit applications, as a practical matter, information on all facets of a project, including potential mitigation, is typically gathered and reviewed at the same time. The Corps, except as indicated below, first makes a determination that potential impact have been avoided to the maximum extent practicable; remaining unavoidable impacts will then be mitigated to the extent appropriate and practicable by requiring steps to minimize impacts, and, finally, compensate for aquatic resource values. This sequence is considered satisfied where the proposed mitigation is in accordance with specific provisions of a Corps and EPA approved comprehensive plan that ensures compliance with the compensation requirements of the Section 404(b)(1) Guidelines (examples of such comprehensive plans may include Special Area Management Plans, Advanced Identification areas

(Section 230.80) and State Coastal Zone Management Plans). It may be appropriate to deviate from the sequence when EPA and the Corps agree the proposed discharge is necessary to avoid environmental harm (e.g. to protect a natural aquatic community from saltwater intrusion, chemical contamination, or other deleterious physical or chemical impacts), or EPA and the Corps agree that the proposed discharge can reasonably be expected to result in environmental gain or insignificant environmental losses.

In determining "appropriate and practicable" measures to offset unavoidable impact, such measures should be appropriate to the scope and degree of those impacts and practicable in terms of cost, existing technology, and logistics in light of overall project purposes. The Corps will give full consideration to the views of the resource agencies when making this determination.

1. Avoidance.[4] Section 230.10(a) allows permit issuance for only the least environmentally damaging practicable alternative. [5] The thrust of this section on alternatives is avoidance of impacts. Section 230.10(a) requires that no discharge shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. In addition, Section 230.10(a)(3) sets forth rebuttable presumptions that 1) alternatives for non-water dependent activities that do not involve special aquatic sites [6] are available and 2) alternatives that do not involve special aquatic sites have less adverse impact on the aquatic environment. Compensatory mitigation may not be used as a method to reduce environmental impacts in the evaluation of the least environmentally damaging practicable alternatives for the purposes of requirements under Section 230.10(a).

2. Minimization. Section 230.10(d) states that appropriate and practicable steps to minimize the adverse impacts will be required through project modifications and permit conditions. Subpart H of the Guidelines describes several (but not all) means of minimizing impacts of an activity.

3. Compensatory Mitigation. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain after all appropriate and practicable minimization has been required. Compensatory actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands) should be undertaken when practicable, in areas adjacent or continuous to the discharge site (on-site compensatory mitigation). If on-site compensatory mitigation is not practicable, off-site compensatory mitigation should be undertaken in the same geographic area if practicable (i.e., in close proximity and, to the extent possible, the same watershed). In determining compensatory mitigation, the functional values lost by the resource to be impacted must be considered. Generally, in-kind compensatory mitigation is preferable to out-of-kind. There is continued uncertainty regarding the success of wetland creation or other habitat development. Therefore, in determining the nature and extent of habitat development of this type, careful consideration should be given to its likelihood of success. Because the likelihood of success is greater and the impacts

to potentially valuable uplands are reduced, restoration should be the first option considered.

In the situation where the Corps is evaluating a project where a permit issued by another agency requires compensatory mitigation, the Corps may consider that mitigation as part of the overall application for purposes of public notice, but avoidance and minimization shall still be sought.

Mitigation banking may be an acceptable form of compensatory mitigation under specific criteria designed to ensure an environmentally successful bank. Where a mitigation bank has been approved by EPA and the Corps for purposes of providing compensatory mitigation for specific identified projects, use of that mitigation bank for those particular projects is considered as meeting the objective of Section II.C.3 of this MOA, regardless of the practicability of other forms of compensatory mitigation. Additional guidance on mitigation banking will be provided. Simple purchase or "preservation" of existing wetlands resources may in only exceptional circumstances be accepted as compensatory mitigation. EPA and Army will develop specific guidance for preservation in the context of compensatory mitigation at a later date.

III. OTHER PROCEDURES

A. Potential applicants for major projects should be encouraged to arrange preapplication meetings with the Corps and appropriate federal, state, or Indian tribal, and local authorities to determine requirements and documentation required for proposed permit evaluations. As a result of such meetings, the applicant often revises a proposal to avoid or minimize adverse impacts after developing an understanding of the Guidelines requirements by which a future Section 404 permit decision will be made, in addition to gaining understanding of other state or tribal, or local requirements. Compliance with other statutes, requirements and reviews, such as NEPA and the Corps public interest review, may not in and of themselves satisfy the requirements prescribed in the Guidelines.

B. In achieving the goals of the CWA, the Corps will strive to avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources. Measures which can accomplish this can be identified only through resource assessments tailored to the site performed by qualified professionals because ecological characteristics of each aquatic site are unique. Functional values should be assessed by applying aquatic site assessment techniques generally recognized by experts in the field and/or the best professional judgement of federal and state agency representatives, provided such assessments fully consider ecological functions included in the Guidelines. The objective of mitigation for unavoidable impacts is to offset environmental losses. Additionally for wetlands, such mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values), with an adequate margin of safety to reflect the expected degree of success associated with the mitigation plan, recognizing that this minimum requirement may not be appropriate and practicable and thus may not be relevant in all cases, as discussed in Section II.B of this MOA.[7]

In the absence of more definitive information on the functions and values of specific wetland sites, a minimum of 1 to 1 acreage replacement may be used as a reasonable surrogate for no net loss of functions and values. However, this ratio may be greater where the functional values of the area being impacted are demonstrably high and the replacement wetlands are of lower functional value or the likelihood of success of the mitigation project is low. Conversely, the ration may be less than 1 to 1 for areas where the functional values associated with the area being impacted are demonstrably low and the likelihood of success associated with the mitigation proposal is high.

C. The Guidelines are the environmental standards for Section 404 permit issuance under the CWA. Aspects of a proposed project may be affected through a determination of requirements needed to comply with the Guidelines to achieve these CWA environmental goals.

D. Monitoring is an important aspect of mitigation, especially in areas of scientific uncertainty. Monitoring should be directed toward determining whether permit conditions are complied with and whether the purpose intended to be served by the conditions are actually achieved. Any time it is determined that a permittee is in non-compliance with the mitigation requirements of the permit, the Corps will take action in accordance with 33 CFR Part 326. Monitoring should not be required for purposes other than these, although information for other uses may accrue from the monitoring requirements. For projects to be permitted involving mitigation with higher levels of scientific uncertainty, such as some forms of compensatory mitigation, long term monitoring, reporting and potential remedial action should be required. This can be required of the applicant through permit conditions.

E. Mitigation requirements shall be conditions of standard Section 404 permits. Army regulations authorize mitigation requirements to be added as special conditions to an Army permit to satisfy legal requirements (e.g. conditions necessary to satisfy the Guidelines) [33 CFR 325.4(a)]. This ensures legal enforceability of the mitigation conditions and enhances the level of compliance. If the mitigation plan necessary to ensure compliance with the Guidelines is not reasonable implementable or enforceable, the permit shall be denied.

F. Nothing in this document, is intended to diminish, modify or otherwise affect the statutory or regulatory authorities of the agencies involved. Furthermore, formal policy guidance on or interpretation of this document shall be issued jointly.

G. This MOA shall take affect on February 8, 1990, and will apply to those completed standard permit applications which are received on or after that date. This MOA may be modified or revoked by agreement of both parties, or revoked by either party alone upon six (6) months written notice.

Robert W. Page /s/
Assistant Secretary of the Army, Civil Works
February 6, 1990

LaJuna S. Wilcher /s/
Assistant Administrator for Water, U.S. Environmental Protection Agency
February 6, 1990

[1] Standard permits are those individual permits which have been processed through application of the Corps public interest review procedures (33 CFR 325) and EPA's Section 404(b)(1) Guidelines, including public notice and receipt of comments. Standard permits do not include letters of permission, regional permits, nationwide permits, or programmatic permits.

[2](except where Section 404(b)(2) applies).

[3] Section 230.3(q) of the Guidelines reads as follows: " The term practicable means available and capable of being done after taking into consideration *cost, existing technology, and logistics in light of overall project purposes."* (Emphasis supplied.)

[4]Avoidance as used in Section 404(b)(1) Guidelines and this MOA does not include compensatory mitigation.

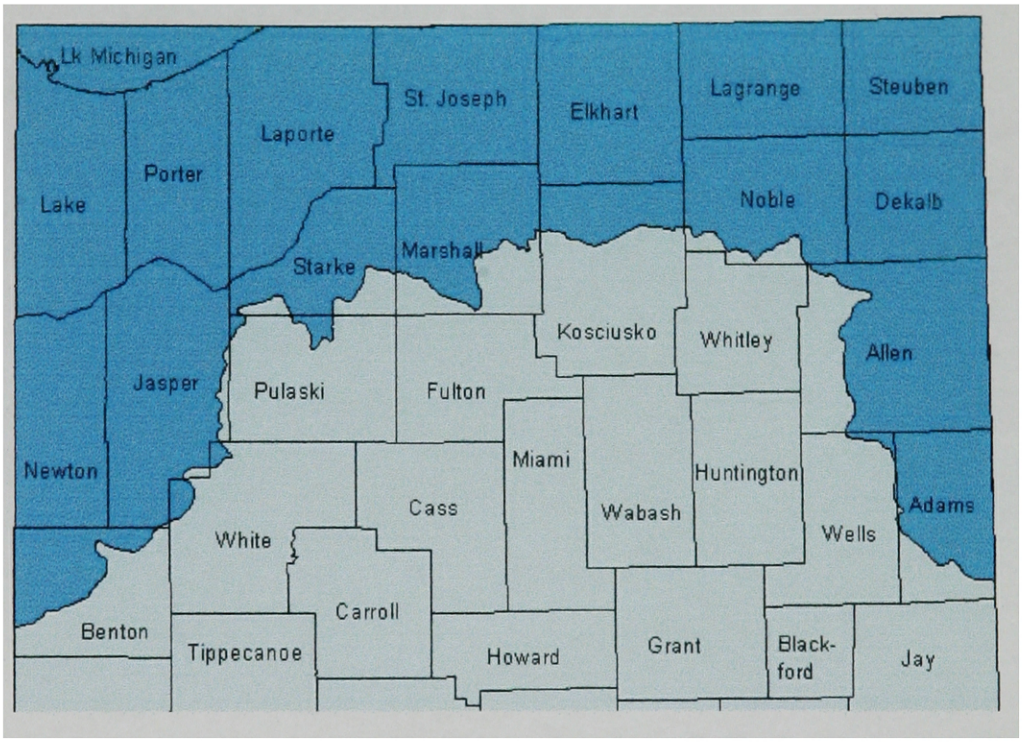
[5]It is important to recognize that there are circumstances where the impacts of the project are so significant that even if alternatives are not available, the discharge may not be permitted regardless of the compensatory mitigation proposed (40 CFR 230.10(c)).

[6]Special aquatic sites include sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs and riffle pool complexes.

[7] For example, there are certain areas where, due to hydrological conditions, the technology for restoration or creation of wetlands may not be available at present, or may otherwise be impracticable. In addition, avoidance, minimization, and compensatory mitigation may not be practicable where there is a high proportion of land which is wetlands. EPA and Army, at present, are discussing with representatives of the oil industry, the potential for a program of accelerated rehabilitation of abandoned oil facilities on the North Slope to serve as a vehicle for satisfying necessary compensation requirements.

Appendix F

U.S. Army Corps of Engineers District Map



Counties or sections of counties within the jurisdiction of the Detroit District of the Corps of Engineers

Contact the Detroit Corps at - 313/226-2218

Counties or sections of counties within the jurisdiction of the Louisville District of the Corps of Engineers

Contact the Louisville Corps at - 502/582-5607